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Publication in The Journal of Periodontology *is not to be understood as indorsement by the Journal or* The American Academy of Periodontology *of opinions expressed in any article, abstract or extract. The object of publishing the various views is to present them without prejudice to the reader for his own evaluation.*

THE JOURNAL OF PERIODONTOLOGY is published to serve as the professional journal of periodontia; to keep dentists in touch with research being carried on in this field and related sciences; to stimulate greater interest in the supporting tissues of the teeth and their relation to oral and general health. The plan to continue the publication of abstracts indefinitely will make the Journal a fund of extensive information, readily available to students, teachers, researchers and clinicians.

The Journal is the official organ of the American Academy of Periodontology and will contain therefore those papers of scientific interest which are presented at the annual meetings of that society. The proceedings of the 1935 annual meeting are published in this number. The July, 1936 issue will contain the abstracts of articles on periodontia which appeared during the year of 1935.

To oppose or intercept a cause is to prevent or dissipate its effects.

As well known as this may be it is the most neglected of all applications in the practice of medicine and the reason for its neglect seems to lie in the failure to think in terms of cause and to too readily assume that our limited knowledge makes it impossible or too difficult to try.

W. H. Perkins, M. D.

THE JOURNAL OF PERIODONTOLOGY

JANUARY, NINETEEN HUNDRED THIRTY-SIX

The Essential Principles of Hygiene*

By W. H. PERKINS, M. D.

New Orleans, La.

HYGIENE is a Way of Living. We no longer look to the beneficent goddess to protect us from the lurking causes of physical and mental ill health for Hygeia remains a myth and we have taken onto ourselves the task of keeping fit and warding off disease. This is a difficult undertaking that requires all of the intelligence we have to put to work the knowledge gained by centuries of experience and the rapidly accumulating tools recently supplied us by the few decades of scientific investigation. The small jobs and drudgeries required to make up the whole of hygienic effort are too numerous and too connected to enable us to tackle each one alone. Our only hope can be to take them in our natural stride, without deliberate thought and with almost consciousless effort as our Way of Living. The naive child can be taught and trained to live this way but we sophisticated adults, unhygienic in our habits to the point of self extinction, must be shown why it is necessary to be hygienic before we will do anything about it, if even then. Hygiene to us is for children and worrisome adults; we who feel that we are healthy can not see the need for hygienic measures other than those necessary to keep us from being obnoxious to our fellows. Only the sick and inefficient, the disabled and defective are expected to give thought to themselves to avoid insults to their bodies, to stem their desires, and behave altogether like sensible humans should about the things that do them harm. This is because we have not learned to live with nature instead of bucking it. I am therefore taking it for granted that all of us here are unhygienic except in so far as we respect the common decencies. On this assumption I am undertaking the task of revealing our shortcomings by reviewing the causes of disease and ill health and pointing to our lapses in dealing with them. The corollaries to these exposures should reveal the essential principles of hygiene as they ought to be lived.

Health is that state of relative equilibrium of body form and function which results from its successful dynamic adjustments to influences tending to disturb it. It is not alone a passive interplay between the body substance and forces impinging on it, but an active response of forces working toward readjustments.

*Read before the American Academy of Periodontology, Nov. 1, 1935, New Orleans, La.

It is comparable to a machine which deals with one initiating force or energy and by reason of its parts is able to convert that energy into other useful forms. The parts through which these forces operate and undergo conversion in the body are the cells and tissues. Although every living cell in the body retains the primary attributes of living material there has been developed a hierarchy among them which has necessitated the subjugation of certain qualities in some and their exhaltation in others; *e. g.* cortical nerve cells have given up their power of reproduction, muscle fibres have superseded all others in their power of contractility.

Because of this mutual surrender of original rights by the cells and the division of labor which necessarily results in such a society of dependent elements the various mechanisms of response have been evolved.

The fundamental conception of physiology is therefore a responsiveness of the cells, tissues, organs and combined mechanisms to forces of varying kinds and degrees. These forces may originate in the external environment and become translated into the energy activities of groups of cells, or they may be energies exhibiting themselves in one cell or tissue group which influences other structures near or far removed from them.

Responses to these forces or energies are not haphazard but evidence a definite course and procedure in their activities; the impression is given that the parts concerned have been "educated" to certain lines of action. Purposeful is an unsafe word to use in interpreting natural phenomena but it conveys a certain meaning when applied to the accurate and almost unerring useful responses in human physiology; it raises the commonplace and often sordid functions of our bodies to the plane of the magnificent much as do the words in Cannon's title, "The Wisdom of the Body."

There is manifested in each of these adjustment phenomena a tendency toward the preservation of a state of limited equilibrium; not the too rigid and static level of a smooth-running engine nor the erratic, inefficient operation of a contrivance without guides and governors. Without too strict comparison it may be likened better to the use of the shock absorber principle or the elasticity allowed in beam construction.

Physiologic disturbance is both permissible and necessary in the human economy. There is strong evidence that the very forces which disturb it have been responsible for its evolution; that without the *need* of readjustment and adaptation, the present forms and functions of the body parts may never have been evolved.

So long as the mechanisms involved in physiologic equilibrium are not pressed beyond their powers of restoration within their established limits and so long as they retain their ability to dissipate the factors operating upon them to their levels of tolerance so we may say that such apparent instability represents the normal.

It is impossible to define normal more strictly than this. Wide variability in structure and function must be permitted if we are to be fair to our conception of the powers of adjustment in the body. Our only restriction is that we should know the limits of tolerance in each of the functional units of which we are composed. Anatomic and physiologic studies have revealed certain types of organization and levels of function which have been found so repeatedly in apparently well regulated bodies that these states have been set as normal against which further observations may be measured. But there is no physiologist or anatomist bold enough to state that these are more than the "apparently" normal.

There are however so many of these apparently normal standards, each qualified with its apparently normal range of variability and each remaining within its limits of tolerance or safety, that we have come to regard that body in which all of these flexible standards are satisfied, as a normal body.

A normal, healthy person, may be regarded therefore as one who can retain all of his organs and tissues in a state of efficient function and physical organization against those external and internal "shafts and arrows of outrageous fortune" that beset him.

Under the average conditions of our existence there are probably few occasions when the balances of the body are tipped to an extent dangerous to efficient functioning. There are many examples of the great elasticity and adjustability possessed by our tissues, by virtue of which they can respond to extra stresses and strains beyond the commonplace. Voluntary and involuntary muscles alike can withstand heavy loads put upon them without serious consequences; forced starvation if not too long continued does not result disastrously; purgation, sweating and diuresis care for elimination of toxic substances which threaten us.

Common experience shows us even without resort to scientific evidence that we can suffer from temporary disorders. Everyone knows that there are times when he does not feel right; that he is aware that something about him is not working as well today as it did yesterday. He may feel "bilious, or liverish"; be irritable and jumpy; suffer from peculiar feelings in the stomach or have palpitations, breathlessness, dizziness and many other common mild complaints. In many cases there is nothing really wrong with him and these feelings are brought about by nothing more than temporary derangements of mechanisms.

These apparent disruptions are in many cases just within the borderland of normal. Although chemical measurements can be applied to them and the microscope may reveal temporary derangements of tissue elements, these changes are within the limits of normal adaptation.

It is difficult, therefore, to define the limits of the normal and to set up normal standards. We know however that every function can transgress beyond the limits of accepted normal and we call this the abnormal and the evidences of it, pathology. In so doing we create a line between the two states which is variously termed the "borderline of disease," the "limit of safety," the "limit of

tolerance" and the "normal limit," each of which implies that the processes of change have been forced to some point which is intolerable or dangerous and from which return is difficult or impossible.

It is upon the definition of this point that the definition of disease must rest. The term disease implies a state manifestly farther from good health than just simple ill health. The man with a "disease" is looked upon as really sick and no longer just feeling badly and out of sorts; pathology is more than simple functional change as we are wont to describe those conditions represented by purely physiologic responses. Such difficulty of definition can hardly be overcome by the naive method of resorting to still further undefinable terms and it must almost be admitted that disease can not accurately be defined. Moreover, our modern conception of disease is as a process, not an entity. The diseases listed in our terminologies are no more rigid and discreet than the processes described within the ranges of the normal and what are called the classical pictures of disease are complex processes having enough in common to permit them to be labeled for convenience.

Since, therefore, the words disease and pathology are obscure it would seem best to use them as conveniences and not for scientific accuracy.

The picture behind every observable state of health or disease is one of change. There is a constant flux in the make up and activity of all cells and tissues so that at no two moments are the arrangements and behavior of parts the same. This change, begun before the union of the parent cells of the organism, continues beyond its death and disintegration. The span of life is thus a continuous flow of energies through a body made up of materials taken from its environment. It creates nothing new within itself, but constantly presents its elemental substances in new and complex combinations, breaks them up and returns them to their source. And while the body grows and carries on its processes of building up and tearing down it is being further buffeted by its environment which it can not escape. It never succeeds in becoming isolated, but remains forever a part of its surroundings. The body may be looked upon as a resultant of forces, every force theoretically measurable and the patterns of their interactions predictable.

Notwithstanding the immensity of the problem of knowing all about man the fact remains that his processes are but built-up mechanisms the beginnings of which are simple actions and reactions between elemental principles, and whose end states are still manifestations of primitive reactions capable of analysis, but complicated almost beyond recognition. Every cell and tissue and organ, every operation within and between its parts, every balanced mechanism, every constructive and destructive process in the body is a result of a preceding cause or causes. The chain of cause and effect is tied up with the universal at birth and death and the body of man is a falsely isolated interference pattern in this concourse of energies.

As well as we can recognize cause behind all things in the physical world, so

we can see that cause must be back of every physiologic and pathologic change. To understand physical form and development we must attempt to understand why we are of such size and build and color; to interpret physiology and adjustments and behavior we should be able to know the plans and patterns on which they have been built and how they have been called into existence; for the proper interpretation of disease it is essential to have knowledge of the causes of these abnormal states, to know what forces are acting to disturb the equilibria and throw them beyond their normal limits.

Scientific medicine has long been probing the secrets of the human body for facts as to the structure and functions of its parts. Out of this study has come a wealth of material, but notwithstanding the phenomenal amount which has been accumulated within the past few decades it is apparent that but a small part of it has been put to work. Both the science and the art of medicine stand in great need of finding application for this accumulated knowledge.

It is suggested here that a hint as to its use can be found in contemplation of the fact that man is just as much a process as a particle. This means that it will be necessary to think more in terms of change and less in pictures of fixed states, to forget that measures are constant and relationships consistent; to interrogate every fact as to why it is so, what brought it about, what changed it; to delve deeper into the mysteries of the why of things and begin to think in terms of Cause.

Considered as a process, each disease must be traced in its development from the first forces which act on the mechanisms concerned through the resulting alterations in form and function involved to its termination by return of the processes to normal or their final disintegration. Such a survey of any disease process would constitute the study of its Natural History.

The patterns which result from similar causes can not be the same unless every conditioning circumstance is the same and every force which is operating is of the same quality and intensity and acts upon material equally susceptible to it. Such coincidence probably never occurs. Variability is almost the rule when disease entities are closely scrutinized and when the reason is searched for it is found to be the interaction of variable causes.

The causes of disease must be pictured as operating long before the disease ever makes its appearance in the subject and they may be working far away from their ultimate victim. They need not by any means act directly on the individual sufferer as there are often a multiplicity of factors inserting themselves between the first causes and the disease condition itself.

Objection will be raised that it is not a disease until the subject becomes effected. If by disease we mean pathogenesis this is entirely valid, but the Natural History of disease may expand our knowledge of it far into the ancestry of the diseased subject, or across the town from where he lives, or into his environment at work, at home and at play. The altered physiology and anatomy, the

symptoms and signs and the pathology are only the final effects in the far reaching complete story of the why and how of a disease.

Throughout this argument the principle of a continuous chain of cause and effect has been maintained as necessary in the explanation of health and disease; it has been held that the causes are familiar, well-known forces in the physical world, and that the first effects are simple biophysical responses to them. Because of this it should be possible to analyze the known facts about each disease and from this analysis to reconstruct its Natural History.

The gaps in this synthesis will necessarily be great in many instances but in some, most of the entire picture can be drawn. But whether or not we can outline the entire course of development of any malady or disease, it is highly probable that we will have revealed some one or more vulnerable points at which it can be attacked and prevented.

To oppose or intercept a cause is to prevent or dissipate its effects.

As well known as this may be it is the most neglected of all applications in the practice of medicine and the reason for its neglect seems to lie in the failure to think in terms of cause and to too readily assume that our limited knowledge makes it impossible or too difficult to try.

But on purely logical grounds, nothing need be inevitable and we can argue that there is no reason why any disease condition *must* develop. That it does so is in response to a chain of events which directs its course *only* in the direction necessitated by the *given* causes. Any slight alteration in the force or frequency of a causative factor or the addition or removal of factors may produce far different results. It would seem only necessary therefore to reveal those places in the natural history of a disease at which effective measures will block its progress.

All of our hope in the prevention of disease rests on this principle.

Viewed in its entirety our environment is seen to contain most if not all of the initiating factors of disease.

It is only when we look too narrowly at disease that we fall into the error of ascribing its causes to happenings within the diseased organism. The clearer but more difficult picture is obtained by pursuing events until the external environment is reached and the primitive simple factors are revealed.

From this desire for a complete understanding of the natural history of disease arises the need for a systematic survey of etiologic factors.

In setting up an etiologic classification on which the principles of prevention may be based there is no obligation to allow for any doubtful factors unless they are such as to be still unknown in the physical world. This is because all forces capable of producing disease *can* be categorized.

The following are the categories into which all causes of disease may be placed:

1. Inherited factors.
2. Defects of nutritive elements.
3. Exogenous chemical elements.
4. Physical force and energies.
5. Parasites.
6. Bio-social and psycho-biologic influences.

These categories constitute therefore the primary etiologic factors in disease; they are the starting points from which all subsequent effects and mechanisms arise. Without these factors there would be no disease for the consequences of their activities would not follow and it is these very phenomena which constitute the developmental processes of disease. To follow any influence from its origin in one of the categories through all of its effects outside of and upon the body, is to trace the natural history of the disease conditions which result.

Provided we could know the set-up of all the factors concerned in the origin and development of a disease we could predict it to a certainty. But intervening influences, not a part of the original set-up may come in to disorganize the entire operation.

The effects of the primitive cause may be altered by changing the alignment of the elements on which it acts and it is in our power to influence this arrangement: or by placing barriers or deflecting mechanisms in its path we should be able to prevent what otherwise would be inevitable. That this is already being done is evidenced in our successes in preventing many diseases due to invading organisms and defects of nutritive elements.

All of the causes as listed and all of the subsequent processes in which their effects become involved are open to attack. Hygiene is the broadest application of this attack. It aims at controlling our environment,—community hygiene; maintaining our physical mechanisms in an orderly state,—personal hygiene; and guarding our mental state and behavior,—mental hygiene.

Before approaching our problem specifically in the realized individual we can point to a still more generalized conception of hygiene as applied to the race. Race hygiene will mean such efforts as may be directed toward race betterment by deliberate attack on faulty inherited factors and an attempt at conservation of race assets. We cannot choose our parents but we have some selectivity in the matter of our children. Although it may be desirable this does not necessarily imply conscious eugenics. Natural eugenics, by which I mean that our social organization and administration should be such as to permit the freest selection of mates outside of their own immediate social groups, would act automatically and far more effectively through chance mating in increasing the probalities of submerging harmful recessive habits. It would constitute a direct attack on the elements in the first Category of Causes and would be hygienic for the race.

On the side of the individual the attack must be on many fronts; the methods used must be broad and general and embrace weapons which will be effective against all causes of disease and ill health. To take conscious thought of every

effort we make to maintain health would be burdensome and obnoxious to most of us and breed a race of finicky hypochondriacs. Food fads and vogues do not last for this very reason. Few of our restaurants continue to print the calories opposite each article of food on the menu. The best defense against defects of nutritive elements from the prenatal period to old age is a clean, well balanced diet, eaten physiologically and all accomplished through habit. All other things being equal an individual who has learned to eat properly from infancy, who habitually eats enough and not too much, who knows intuitively what a good diet is will never be the victim of many of our dietetic diseases. He will never develop pellagra, nutritional enemia, defective teeth due to this cause, nutritional edema or polyneuritis, dyspepsias and food indigestions and probably many others in which nutrition plays but one part in the cause, as pernicious anemia, obesity and diabetes.

The well balanced diet contains sufficient water, proteins, carbohydrates, fats, minerals and vitamins to meet the body requirements. When properly taken it cannot alone disturb normal mechanisms beyond their limits of tolerance and it supplies all that is necessary to maintain their balances.

We are guarded against most external poisons by a beneficent government. The Food and Drugs Act has in all probability saved thousands of us from poisoning by food adulterants and preservatives. But there remain plenty to plague us. Alcohol, coffee, tea, tobacco, opium are all poisons. When used reasonably and hygienically they do no harm for our mechanisms can cope with them in small doses. We have also to face the host of proprietary drugs foisted on us by advertisers. Many are harmless as recommended but their margin of safety is small and we do best by avoiding their use by self medication. If we all reacted equally to the same dose of these drugs they could do little harm but such is not the case. The person who respects his physiology will not insult it by the indiscriminate acceptance of the claims of advertisements.

It is undoubtedly in the best interests of hygiene to be cautious in crossing a busy street or to take care in stepping out of a slippery bath. It is less obvious to avoid straining at stool and run the risk of aggravating hemorrhoids or potential hernia, or to see the need of good body mechanics in the prevention of flat-foot and visceroptosis. Yet both of these are either deliberate caution or acquired good habits directed against the Category of Physical Force. Faulty dental occlusion is a mechanical defect which may result in a serious train of disorders; the accumulation of wax in the external auditory canal can lead to deafness.

Within this Category come also the factors of heat, electricity, sunlight, temperature, atmospheric pressure. Entire disregard of their potential harm is entirely unhygienic and frequently fraught with grave consequences.

The Parasite Category includes all bacteria and animal parasites. Lice are unquestionably unhygienic but far less so than streptococci or staphylococci in the pus pockets of an otherwise healthy mouth.

It is not only impossible but probably very undesirable for us to attempt to evade all bacteria. They invade us from the time we take our first lusty yell at birth and this invasion in many instances is useful, for the doses are small and if our resistance is good, it results in an efficient acquired immunity. The particular individual whom we occasionally see taking out his handkerchief and laying it on the doorknob before turning it is not being as hygienic as he is foolish.

On the other hand we do not deliberately subject ourselves to virulent organisms known to be present. It is foolhardy to play free with diphtheria bacilli, tubercle bacilli, gonococci or spirochetes and when in their presence or suspected presence it is the height of hygiene to adopt preventive measures.

These are but a few of the aspects of resistance against invading parasites. Inheritance, nutrition and many other individual and social factors enter the fight against them. Cleanliness comes first and embraces everything of a cleanly nature from the use of soap and water to actual germicides and disinfectants. No knowledge is required for the adoption of clean practices but untold benefits are gained by it.

A sound mind in a sound body is the aim of mental hygiene. Almost all that we do and think is the result of factors working in the Biosocial, Psychobiologic category. These factors make up all of our environment relating to the relationships between man and man, and man and his institutions. Through these relationships we have built up our memory, associations, will-power, inhibitions, emotional and behavior reactions, our philosophy, religion, fears, likes and dislikes, and our repressions and expansions. None can doubt that with all of their potential power for good, they can also do harm. This they accomplish by upsetting the mental balances so that we develop such things as emotional states, maladjustments and abnormal behavior in changing situations.

Mental hygiene is found in a mind buffered by a healthy outlook, able to stand alone in its resistance to all forces tending to disturb it and therefore balanced.

Hygiene as we have seen it is therefore physiologic, intelligent and scientific —as applied, it is a Manner of Living gained by intelligent training, constructive thinking about oneself without worrying, and the intuitive adoption of clean and healthy habits.

Again we must repeat, the causes of disease are all natural causes and can therefore be dealt with in an intelligent manner to modify their results. Preventive Medicine and Preventive Dentistry are only at the beginning of their preventive efforts and have hardly touched their possibilities.

If all secondary joint diseases, sciatica, neuritis, and gall-bladder disease could be prevented by daily cleaning of the teeth the dentist's and physician's work would be largely done. But this simple, frequently little more than esthetic procedure, cannot do it. Real dental hygiene, as with every other phase of our subject, must embrace all operating causes. The professions alone are capable of doing this and so our greatest effort must be to get people to give us the opportunity. Once this is granted we must first understand what we are to do about

it and we must approach the problems of prevention and commonplace hygiene with enthusiasm and assurance that this type of practice supersedes all others for the greatest good of the race and the individual.

Announcement

The Twenty-third Annual Meeting of the American Academy of Periodontology is to be held on July 9, 10, 11, in San Francisco, Calif.

Headquarters will be in the Palace Hotel. RESERVATIONS SHOULD BE MADE AT ONCE DIRECTLY WITH THE HOTEL. (Other hotels and rates may be found listed in the Journal of the American Dental Association April, 1936, p. 730.)

It is very important that information be obtained from local railroad offices about the time certificates go into effect in your zone. Be sure to obtain your certificates when purchasing tickets.

All members of organized dentistry are urged to attend this meeting.

966 Fisher Bldg.,
Detroit, Michigan.

CLAYTON H. GRACEY,
Secretary.

Further Studies on Bone Generation with the Use of Boiled Heterogeneous Bone.*

By Frank E. Beube, D. D. S., and Herbert F. Silvers, B. S., D. D. S.,
New York City

THE alveolar and maxillary bones are destroyed and lost by the invasion of various types of pathology. In many instances the affected bone is not repaired and replaced by the formation of new bone after the disease is eliminated and healing has taken place.

This loss of bone leaves behind a trail of loose teeth; rarefied areas at apices of the roots; deformities of the jaws and face; flabby, fibrous and flat edentulous alveolar ridges.

The attempts made to restore the bone lost in these abnormalities has been primarily in cases of large defects of the jaw bones, with the use of live autogenous bone graft. Other forms of bone grafts, such as boiled autogenous bone, live or boiled homogeneous bone, ivory, etc., had been considered inferior for bone regeneration, because they might act as foreign bodies. Heterogeneous boiled bone was listed as the least desirable form of bone transplant, even of less value than ivory or metal.[1]

In an earlier experimental work[5] on the jaws of dogs, the writers simulated pathology found in human jaws. In this study they have shown that the insertion of heterogeneous boiled bone powder into a surgically produced cavity overlying the teeth, will induce generation of new bone in the alveolar and maxillary bones. In addition, the lost cementum, which had been denuded from the dentin, was replaced by osteoid tissue. A new peridental membrane was formed between the osteoid tissue and new bone.

Efforts have since been made with the use of the boiled heterogeneous bone powder, to restore bony tissue lost in the following types of human pathology: periodontoclasia, cysts, and extensive alveolar resorption in an edentulous mouth. We also experimented with generation of bone in alveolar sockets after extraction and with a type of case similar to the work on the dogs. The bone pack was obtained by reducing to a powder, a section of the long bone of a cow.

Fourteen cases were operated, involving five different types.

Type I.—One case, female, negro, age 30.

Dental Diagnosis: rarefied areas about size of a pea at the apices of upper right and left first bicuspids. An incision was made and mucosa retracted.

*Read before the American Academy of Periodontology at its 22nd annual meeting, Nov. 1, 1935, New Orleans, La.

Research from the Department of Periodontology, School of Dental and Oral Surgery, Columbia University.

The authors gratefully acknowledge their indebtedness to Dr. Harold J. Leonard, Dr. Daniel Ziskin and Dr. Houghton Holliday, for guidance and many valuable suggestions throughout the investigation; to Dr. C. F. Bodecker, for making available to us the histological laboratory; to Miss Nesta Hughes for the preparation of the histological specimens; and to Dr. Adolph Berger, for the use of the operating rooms in the department of Surgery.

The buccal plate overlying the roots was removed and the teeth extracted. One socket was used as an experimental side into which sterilized powdered bone was inserted and incorporated with blood, in order to have the subsequent clot act as scaffolding and binder for the powder. The mucosa was tightly sutured to place. In the other, as control, the mucosa was merely sutured over the blood clot. (Control was operated two weeks earlier than experimental.)

Case was examined clinically and by X-ray, weekly, for six months. Bone was deposited in both cases, but the socket which was treated with the powder showed a greater increase in radiopacity when compared with control area. At the completion of the six months, the bone in control socket showed a greater radioluscency than the experimental, and a depression could be palpated in the buccal plate, which was not evident on experimental area.

TYPE II. Five cases, two were discarded because of suppuration, the remaining three showed new bone formation. The following is typical of this group: female, white, age 26.

Dental Diagnosis: Large cystic area associated with upper right lateral incisor. Incision, retraction and removal of labial bone revealed a cyst about 1 1-2 cms. in diameter. The palatal bone was destroyed by the invasion of the cyst.

After removal of cyst, by blunt dissection, powdered bone was inserted, incorporated with blood, and the flap of the mucosa was sutured to place.

Twenty-four hours post-operative, patient developed a temperature of 100.° Temperature normal on second day. X-rays were taken weekly for one month. Patient was not seen for following ten months. At end of this period, x-ray disclosed area filled in with new bone.

TYPE III. One case, female, negro, age 30.

Dental Diagnosis: Extensive alveolar resorption of lower edentulous ridge. In lieu of a normal alveolar ridge, a fibrous rim, which could readily be moved to and fro, extended from third molar to third molar. X-ray disclosed a "knife-like" ridge, about 3 mm. in height, above the body of the lower maxilla, and approximately one mm. or less in thickness.

Incision and retraction verified the x-ray picture. The periosteum and some of the thin alveolar process was removed and discarded by filing. Inserted bone powder, and sutured lips of wound.

Temperature of 100° on first day. Normal on second day.

Six weeks post-operative, x-ray disclosed a thickening of alveolar bone.

Area was examined periodically; clinically and by x-ray (fifteen times in all) for fifteen months. The alveolar bone presented a gradual increase in density and thickness. Dentures were inserted seven months post-operatively. The last x-ray, which was taken fifteen months after operation, disclosed a bony ridge, which was about 4 mm. in thickness; approximately four times thicker than original bone.

TYPE IV. Two cases, both successful. The following is typical of this group: female, white, age 30. Dental Diagnosis: Upper right second molar condemned because of uselessness for restorative purposes, otherwise normal. Incision and retraction of mucosa overlying tooth revealed the buccal plate intact. A piece of this bone, about 5x7 mm. was removed, in addition to the cementum in this area. Bone powder was inserted and flap sutured to place. After seven weeks, the tooth was surgically removed with the buccal plate intact and decalcified sections of the specimen were prepared. Histological examination disclosed the formation of osteoid tissue, which replaced the lost cementum. A new peridental membrane was formed, which divided the osteoid tissue from a *new* alveolar plate.

TYPE V. Five cases, one successful. A typical case follows: male, white, age 40.

Dental Diagnosis: periodontoclasia.

Oral examination disclosed the presence of the upper and lower six anterior teeth only, with 3 to 4 mm. pockets about all of them, except an 8 mm. pocket on the mesial of the lower left cuspid, which was quite mobile. The periodontium (all enveloping tissue) about this tooth was continually traumatized by the upper cuspid, due to its peculiar alignment. The gingiva about all the teeth was inflamed.

After six periodontia treatments, of the conservative type, grinding of the upper and lower left cuspids, plus instruction of a toothbrush technique, the inflammation disappeared and pockets were obliterated, except the single deep one which shortened from 8 to 5 mm. Patient was dismissed and returned in four months. Pocket on lower cuspid again 8 mm. in depth; remainder of mouth healthy.

Further treatments were instituted about this tooth, but pocket depth was not eliminated, but fluctuated from 8 to 5 and back to 8 mm.

After three more months of this ebb and flow of depth of pocket under the conservative treatment, the case was operated. This was now ten months since the beginning of the treatments.

Incision and retraction revealed the interdental bone lacking between lower left lateral and lower left cuspid, as far as the apical third of the roots of these teeth; except the thin labial aspect of this interdental bone, of which the cervical third was lost. A bulk of fibrous tissue, which was removed, was present between the respective teeth. The exposed alveolar bone was filed, and made smooth, and roots of teeth polished with curettes. Sterilized bone powder was inserted and flap retained with interrupted sutures.

The case was examined and x-rayed periodically. Eleven months after operation, the pocket was obliterated, there was no mobility and the alveolar bone was restored to middle third level.

As stated above, this periodontoclasia case was the only one which showed

bone regeneration. In all of the five cases, the mouths of the pocket remained open after the insertion of the bone powder.

Without discussing the reasons why some pockets are eliminated and others are not, we do wish to emphasize that because there was not a closure of the pockets, fluids of the mouth seeped in. This may have interfered with the organization of granulation tissue due to washing out of the clot, or the prevention of the growth of cells because of this fluid medium.

Due to the absence of a clot and subsequent granulation tissue, the particles of bone were not retained in situ. The fibrin of the clot has a great affinity for calcium and acts as a scaffolding and binder for the powdered bone.

The regeneration of bone in this case of periodontoclasia, may not be entirely due to the use of the bone powder, but may have been augmented by the reaction of the surrounding tissue to the operation, which was more extensive in this than the other four cases, thus creating a large amount of tissue death.

Murray[14] points out that when there is death of tissue, it creates a pH to the acid side in the hematoma and tissue fluids about the site of a fracture (the operation in our case). This pH is of importance in the production of the *local source of calcium.* He states further that the hematoma or blood effusion at and about the site of fracture influences the growth of *granulation tissue,* thru its fibrin content. And all other factors being equal, the amount of callus produced is directly proportional to the amount of granulation tissue produced.

It would seem, therefore, advisable in instances where bone regeneration is attempted, whether with or without the calcium ingredients, the surgical interference, with both the hard and soft tissues, should be of such a nature as to cause a relatively large amount of tissue death. This type of surgery in cases of periodontoclasia need not include a removal and mutilation of the gingiva.

The use of the bone implantation in the form of powder readily permits interlacing of the fibrin of the blood effusion between the fine particles. The newly formed capillaries can permeate this mass readily, thus establishing a desirable circulatory status between the particles and the surrounding tissue. The use of bone chips, as a local source of calcium, or the insertion of a single piece of bone as a graft, would not be as conducive to this result.

The writers are also of the opinion that the finer the bone particles, the more readily and quickly will they be demineralized and the calcium salts freed and utilized for the formation of new bone.

Heterogeneous boiled bone powder might be applied and aid materially in generating new bone, and for healing of other affections of the teeth, alveolar process and maxillary bones, in cases other than those described in this paper. There is also the possibility of its use in maintaining the alveolar ridge for dentures by immediate insertion after extractions. Work along these lines, as well as a continuation of the reported study is now under investigation.

Summary.

Boiled heterogeneous bone powder will induce new bone formation and regeneration of bone in areas where some bony tissue has been lost through the invasion of various types of pathology.

It will induce new formations of osteoid tissue and bone in surgically produced bone cavities and on denuded dentin.

The time required for generation of bone is greater when the powder is not deposited.

Regeneration of the bone did not occur in the operated cases whenever suppuration set in.

No apparent general or local reaction resulted from the use of this foreign substance, which is apparently tolerated by the tissues.

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Facts, Fads, and Fancies in Dietary Science With Special Reference to the Application to Periodontology*

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PROFESSIONAL and lay magazines, books, and lecturers are spreading information about diet, a subject which appeals to many people because food occupies so much of their daily time and thought. Periodically, certain faddists dominate the field through their expert use of modern methods of propaganda and high-pressure salesmanship. Usually these fads deal with general nutrition, yet they point out dental ailments which they claim are due to neglect of their recommended rules. The most popular cure-all at present is that of the William Howard Hay school on the incompatability of carbohydrate-protein combinations. They claim that such combinations cause delay in digestion, that starch and protein foods create a different response in the stomach digestion, that fat introduced during a meal inhibits secretion of gastric juice for from one to two hours, that carbohydrates digest only under alkaline conditions. The arguments presented in explanation often sound plausible even to the educated person unless he knows the scientific evidence to the contrary. Briefly, what is the evidence?

Dr. Martin Reyfuss (1934) has reported recent experiments, verifying earlier work on normal individuals and extending this to persons suffering from chronic diseases of all types, to refute the statement that the "Hays" health rules are necessary for the unwell person even if not for the healthy. His experiment shows that slow and rapid types of stomachs are found in both normal and diseased individuals, and that in all individuals of different types there is no incompatability between protein and carbohydrates. In fifty chronic diseased individuals, 100 gms of hamburger steak was digested in three hours and fifty-one minutes; 100 gms of meat, 100 gms of potato, and 43 gms of butter in four hours and two minutes; a total of eleven minutes difference. This slight delay was due mainly to greater bulk and quantity of food. The computed general acid figures for gastric contents from two hours after ingestion show similar figures for both groups. These studies emphasize the singular constancy of the individual digestion.

A fact that has apparently escaped the proponents of the carbohydrate-alkaline theory is that no carbohydrates are ingested which are not followed by a direct acid response on the part of the stomach; in other words, the normal digestion of carbohydrates is attended by the maceration of the carbohydrate in an acid medium before it is available for further digestion in the intestine,

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which *too* is *acid*. Dr. Reyfuss stated that there is no evidence either in the literature, or in his investigation to indicate that protein and carbohydrates are incompatible in the stomach. The danger of such teaching based on a lack of scientific evidence is manifest, and while it may be true that many individuals overeat and are presumably better by a reduction of carbohydrate, the unqualified acceptance of such teaching can lead to the occurrence of serious malnutrition. Individual idiosyncrasy or physical conditions are the only bases for avoiding certain foods and combinations, and as there are many reasons for the idiosyncrasies, such decision should be in the hands of the trained physician and dietitian.

The proponents also forget that a separation of protein and carbohydrate in the diet is actually impossible outside of a chemical laboratory, unless one chooses to subsist largely on egg white and cane sugar. Milk, vegetables, fruits, and cereals all contain both substances so that even a strict adherence to the diet list does not limit the food to carbohydrate or protein at one time. Whenever digestion starts, *all* the *types* of juices flow, so the system acts most economically on a combination of foodstuffs. Some people benefit from "dissociation" of the dietary, some because of optimistic suggestion and some with the subconscious introduction of the general type of reform which newer knowledge of nutrition teaches.

Other taboo combinations, such as acid fruits and milk, and fish and milk, are equally untenable. Choice of foods that go well together depends partly upon racial habit, with its development of taste and physical adaptation. To the American, apple pie and cheese, or baked beans and brown bread are traditional combinations, yet there is no dietary reason for serving these foods together. New combinations and radical changes in diet are best introduced gradually. An abrupt change in diet is apt to upset digestion, as is well evidenced by travelers in a far country, or by foreign residents who cannot obtain foods of the type and preparation to which they are accustomed.

Another fad more specifically of interest is the vitamin C or citrus fruit phantasy as sponsored by the California Fruit Growers Exchange. Every type of magazine carries the advertisements based on the work of Hanke (1933). Wondrous are the actions of orange juice according to a recent display which states: "Many people now drink orange juice twice daily because they seem to feel better, tire less quickly, look better, think more clearly." Hanke's work was done on children, ages ten to seventeen years. Because children are growing in addition to maintaining body functions, it is to be expected that many substances may be needed in greater amounts than for maintenance only. Thus the conclusions drawn from results on the three hundred forty-one cases cannot be transferred directly to the adult, as is implied in the advertising.

Of two hundred sixty-seven children in residence at the end of the three and one-half year experimental period, one hundred and twenty who showed

gingival improvement with the greater quantities of orange juice redeveloped some gingivitis on three ounces, yet one hundred forty-seven showed no such regression, of which fifty-five showed no change for three years regardless of diet. One must also remember that it is extremely difficult to chart improvement or change in gingival tissues which show inflammation. Unless the case presents extremes between the traditional pink stippled healthy gum and inflammation, positive statement of change is open to question.

Hanke's conclusion that citrus fruit juice contains "substances that are specifically antagonistic to gingivitis or dental caries" is unwarranted in that tests were not carried out to eliminate the effect of other possible actions of orange juice. The results may have been brought about by the cleansing action of the large quantities of juice, as suggested by several reported tests of the ability of this juice to dissolve plaques on the teeth, or by salivary stimulation with its opportunity for cleansing. Again, the action of citrus juices in acidifying the contents of the intestinal tract favorably influences the absorption of calcium, while end products which help the alkaline reserve within the body may be predominant. Neither does the report indicate that vitamin-C content is the crucial factor.

No doubt many people who have a low intake of uncooked foods, and of foods alkaline in end reaction, will notice general improvement upon taking two large glasses of orange juice with the juice of half a lemon daily, but they could substitute tomato juice, fresh cabbage or turnip juice, or other more economical forms. Until more specific information is available, we are not justified in recommending routinely amounts of orange so much greater than present knowledge indicates. This is another instance of the fallacy of advocating one food substance without taking cognizance of the other food factors.

Not all food fads are necessarily false, some are sound but carry undue weight. Spinach and dark-bread propaganda are good examples. These are extremely valuable foods, but are not alone in their groups. Their advertisement has helped though, by making Americans more vegetable and salad conscious.

Daily papers in the North Central states are carrying "Drink More Milk" displays. The need for such emphasis is shown by the results of the survey of fifty-nine cities made by the Department of Agriculture in neighborhoods where incomes range from average to low. The preliminary reports state that the average family on the survey consisting of 5.44 persons including 2.69 children, purchased 1.37 quarts of fresh milk daily. The combined per capita purchases of evaporated and fresh milk were more than 27% below the quantity of milk specified in the "restricted diet" worked out by the Federal Bureau of Home Economics. This diet is considered so low in nutritive content that it would be unsafe to go below its level or to attempt to subsist on it for more than a limited period. Comparing the average milk purchases reported in the

survey with diets at a higher level, they were found to be 57% below the milk quantities specified by the Bureau for an adequate diet at minimum cost, and nearly 64% below the quantity called for in an adequate diet at moderate cost.

There are a few writers who take exception to the need for inclusion of milk in diets. In a recent article in the Journal of the American Dental Association, J. Sim Wallace suggests that the use of milk for children not only does not aid in making teeth resistant to caries, but is instrumental in making teeth decay. He states that the dental profession must get rid of the obsession that a pint to a quart of milk daily "is a necessity" for boys, girls, and expectant mothers, and advocates food which resembles milk from the point of view of nutrition, but which differs from milk in its physical characters in accord with the physiologic requirements of the teeth. He does not tell us what other common high-calcium food can be substituted, while dietary study impresses upon us the comparatively few rich sources of calcium other than milk. There may be some justification for the objection to the use of milk in softening foods, thus lessening the stimulating function of chewing in arch development, but not for its condemnation as a foodstuff. With our surveys showing so low a milk consumption in a country supplying large amounts of dairy products as in the United States, we can hardly decry the publicity for the use of milk.

Certain other investigators claim that nutrition plays little role in dental disease, because blood serum tests for calcium and phosphorus generally show only slight variations of normal content. Such reasoning is not trustworthy, because it is probable that as body fluids must be kept within certain limits in order to sustain life, the proper proportion of mineral is maintained by drawing upon the bones when intake or utilization is too low.

This short resume of the several prominent fads brings the realization that in human nutrition present scientific information is such that one should not stress the primary importance of a single item, but rather, each must be considered along with other food constituents and habits, so that every person will have a well-balanced diet with adequate proteins, carbohydrates, fats, minerals, and vitamins. It is desirable to keep the fuel value essentially the same from day to day, to include the variety which comes from differences in form, color, flavor, temperature, and texture.

We realize that periodontal tissue health and disease often depends upon nutrition rather than heredity, endocrine disturbances, or bacterial invasion. Some significant research verifies this theory, though as yet information is fragmentary and merely indicates the possibilities. One group believes that the health of periodontal tissues is dependent mainly upon primary structure. Mellanby (1930) states that the chief structural defects are seen when vitamins A and D are deficient or the diet is otherwise chemically inadequate during development, and that a large supply later does not compensate entirely for

early deficiency. Yet if early developmental diet is good, the tissue is quite resistant to later deficiency.

The classic work of Bauer, Aub, and Albright (1929) and verified by others, showing that the bone is in a constant state of flux, the trabeculae acting as a reserve supply of calcium, which is depleted by prolonged neglect of calcium balance and by growth, but which is accumulated under long continued high-calcium diets, suggests that improved or inadequate adult diets should cause changes in the periodontium despite primary structure. The situation is very different from that of tooth development. But there seems to be little doubt that early adequate diet tends to aid regular jaw development and tooth position, and in that way indirectly assists in periodontal tissue health.

A second theory is broader and more inclusive as it emphasizes the results of lack of certain essential vitamins and minerals in the diet not only during development, but throughout life. Wolbach and Howe (1933) have shown that the earliest demonstrable effect of vitamin A deficiency in rats and guinea pigs is upon epithelial structures; an atrophy with substitution of stratified keratinizing epithelium. Similar changes have been found also in the human, dog, rabbit, and calf. Symptoms occur more promptly in immature than in full grown animals. Reparative changes take place in rats in six to fourteen days, equal to a span of six to fourteen months in the human. It no longer seems tenable to characterize the condition of vitamin-A deficiency by eye pathology, the epithelial changes being better and earlier. This finding is significant because of the epithelial tissues in the mouth.

Becks and Weber (1931), Kronfeld and Barker (1932), and Templin and Steenbach (1933) all indicate the value of vitamin-D, particularly when calcium is low, although the sole addition of vitamin-D cannot be expected to give complete protection to the bone when calcium is low or other dietary essentials are inadequate. This work shows the value of vitamin D as a food constituent for the adult. When it is administered in moderate amounts in connection with either a high calcium-low phosphorus ratio or low calcium-low phosphorus ratio, calcium and phosphorus are conserved to a remarkable degree.

Howe (1922) and Hojer and Westin (1925) show bone changes when vitamin C is seriously lacking. Because of the early date of this work, results may be due partially to vitamin D inadequacy; as this vitamin was just coming to the fore, there was no adequate provision for its inclusion in experimental diets. It has been shown that when several substances are very low, reactions are more positive than when only one substance is low. Definite information pertaining to vitamin C influence upon gum tissue other than extreme lack with scurvy symptoms has not been reported. Now that the chemical nature of vitamin C as ascorbic acid is known, more positive research may give information uncomplemented by the actions of large quantities of orange juice.

Sherman and Booher (1931) in rat experiments showed that normal

growth does not mean normal development, that is, a calcium-poor condition of the body may co-exist with normal increase of body weight and with every appearance of good health as indicated by a physical examination. In fact, they found the percentage of body calcium higher for animals of inferior growth, just as physicians report that infants gaining weight more slowly than normal are not as susceptible to rickets as the normally or rapidly growing infant. The percentage of body calcium increased with the increase of calcium-content of food.

Yudkin, Farquhar, Reed, and Wakeman (1934) also find that rats on inadequate inorganic salts develop marked osteoporosis of bones. Jones and Simonton (1929), and Becks and Weber (1931), report that bony changes of the jaws are more extensive in calcium deficiency than changes of the general skeletal system.

A further theory is that the lack of local stimulation and exercise of modern diets is responsible for periodontal disease. Unquestionably, friction, whether by food or a toothbrush, is a factor in maintaining gingival tissue health, but beyond a reasonable amount of function in the adult, experimental evidence and reports of the prevalence of diseased gums even in nearly all primitive races, suggest that lack of need to chew modern diets is less important than the present high refinement of modern foods which makes it more difficult to get all necessary elements without planned diets. Howiett, Fleming, and Simonton (1928) tested liquid, regular, carbohydrate (sticky), detergent, and balanced diets with and without the use of the toothbrush. They found the mouth cleanest after the balanced diet rather than the detergent, but that artificial cleansing with the brush was many times more effective in reducing the absolute amount of mouth organisms than supposed cleansing by detergent diets. Mellanby (1930) concluded that a continuously soft and sticky diet containing abundant carbohydrate so long as it is of proper nutritional standard can be eaten by dogs for at least eight years without development of periodontal diseases, local or general.

There is much discussion of the relative values of acid-base potentials of the diet. Much publicity has been given to the work of Martha Jones in which she emphasizes the value of an alkaline-potential diet for caries control, but whose charts and statements indicate that this same diet seems to be less desirable for adults, as they all show symptoms of periodontoclasia. This is also borne out in the analysis of the experiments on dogs, where excess alkaline was usually associated with more or less retrograde change in long bones and alveolar process, but not in enamel. Morgan (1935) states that in the absence of vitamin D, the acid diet was the most harmful and the neutral diet the least harmful to bones, but as the dogs on the alkaline diet had the greatest rapidity of growth, this may have been a factor in the development of rickets. All of the eight dogs on the alkaline diet, two of five on the acid diet, and one of four on the neutral diet showed some pyorrhea.

This evidence is contrary to that supplied by Hawkin's (1932-1933) analysis of two hundred cases in which he states that when potential alkalinity is high with high calcium as compared to phosphorus, there is practical immunity to pyorrhea, wherefore he advocated increase in consumption of alkaline-potential foods.

Price (1935) made a theoretical evaluation of many primitive diets and his findings cause him to disagree with Jones's statement that a change from high immunity to dental caries to a high susceptibility among the primitive racial stocks is associated with a change in acid-base potential of the diet.

The problem is confused too, because there is great variation in the proportion of ultra-violet rays in sunshine in different areas, it being low even in the very hot, bright, abundant sunshine of Fresno, California. In addition, there is variation in the amount of sunshine available in different sections as is clearly shown by comparing the transitory sunshine of the long months of winter in Minnesota to the long period of sunshine in a state such as Texas.

It seems generally accepted that ultra-violet rays have an acid effect upon the body, so if the sun shows a high proportion of these rays there may be some value in the conclusions of Martha Jones that in tropical climates a larger excess of alkaline elements in the diet is best. But as so many reported "acid" diets are predominantly cereal and muscle meat, and are therefore not adequate in other respects, one must consider this in drawing conclusions. More work still must be done to differentiate between the acid-base effect of stated diets and the effect of the addition of minerals and vitamins when utilizing the alkalinizing "more fruits and vegetables" theory. With substantial evidence that periodontoclasia is prevalent under both acid and alkaline-potential diets, it would seem that some other factor must be of greater importance.

Research on salivary changes by Clark and Shell (1929), and Forbes and Gurley (1932), using various test diets, suggests that the elements in the food may be more important than its potential alkalinity in determining salivary neutralizing power. Diets which brought about tissue improvement tended also to approximate normal dietary standards more nearly than previous diets. Tishler (1929) analyzed one hundred and one cases showing varying degrees of periodontal lesions. 96% showed an unbalanced diet, with the majority deficient in a number of items, particularly calcium and vitamins A and D.

Because a slight, long-continued deficit may bring about a breaking down of tissue not seen in shorter tests, and because high refinement of foods and exploitation of prepared foods by advertising changes foods and food habits, we need to take intelligent care in reinforcing modern diets to make them efficient and equivalent to the simple, protective, primitive foods. Until more specific information as to dental health and nutrition is amassed, the periodontist should recommend a diet balanced to the accepted nutritional standards, yet of better quality than demanded for mere maintenance. Such a diet should be planned

to include daily: the efficient proteins, the necessary essential fatty acids, the standard amounts of calcium, phosphorus, iron, vitamins A, B, C, G, with D by sunshine or concentrate whenever symptoms of possible lack are noticeable, and carbohydrates to raise the energy value to the proper level. The standards for the average normal adult are 1 gm protein per kilogram of body weight, 35% of calories as fat, 45% carbohydrate, calcium 0.68 gm, phosphorus 1.32 gm, iron 0.015 gm, iodine 0.001 gm, vitamin A 3000 Sherman units, B and G 900 units, C 60 units. These can be satisfied by averaging daily, one serving meat, fish, or poultry, one pint of milk in any form, two tablespoons of butter, one egg, one serving citrus fruit or tomato, one serving of other cooked or uncooked fruit, one serving raw vegetable, one serving other cooked or uncooked vegetable, and one serving potato, with yellow or green vegetables given predominance. When cereals are added to these essentials for palatability and energy, all factors with possibly the exception of iron and vitamin B will be satisfied. Even with so liberal a list, these two factors are difficult to supply unless one is fortunate in the choice of foods.

So long as these standards are approximated, we can be assured that the nutritional ***intake*** is satisfactory. Any nutritional lack then is due to some factor of ***utilization*** which may be concerned with individual idiosyncrasy, rest, or actual physiological fault. Usually the system can make its own adjustments and can function efficiently if the standard requirements are furnished with reasonable regularity. The many traditions and false impressions which have grown up about foods, rooted in ancient tribal or religious taboos, or as a result of misinterpreted experiences or of faulty reasoning, must be overcome by modern scientific research with its knowledge of what food does for the body and how it does it.

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Preliminary Report of An Investigation of the Blood Changes in Dental Radiologists*

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IN CONDUCTING a class in hematology with our local Dental Study Club, my associate, Dr. O. C. Barker, made a complete blood examination of each member and found that those who made a great many X-ray exposures had a very high lymphocytic count. This suggested to us the importance of a survey to determine the blood cell condition in those dentists who are doing this work. This preliminary report is based upon the blood examinations of seventy-five dentists who are doing more or less X-ray work.

In attempting this investigation we appealed to some of the leading men in this work for their coöperation. The response was very gratifying. Through the cooperation of Dr. Thomas Cook and Dr. J. L. T. Appleton of the Thomas W. Evans Museum and Dental Institute School of Dentistry, University of Pennsylvania, the Philadelphia Stomatological Society made this investigation possible by financing the blood examinations of a number of Philadelphia dentists who make a great many X-ray exposures. Dr. Katherine Polevitsky of the Evans Dental Institute made the blood examinations, and due to the completeness of her work the thirty-nine examinations made by her will be used in our differential analysis.

A partial review of the literature reveals some interesting findings. Colwell and Russ (Hector A. Colwell and Sidney Russ, X-ray and Radium Injuries Prevention and Treatment, Oxford University Press, London, 1934), in describing the action of X-rays and radium on the blood say, "The first experimental observations upon animals were those of Heineke. Heineke made the fundamental observation that radiation produces a marked leucopenia, but was unable to detect any effect upon the red cells. Helber and Linser corroborated his findings, adding the important fact that the lymphocytes were the most sensitive among the leucocytes.

'Murphy and his co-workers at the Rockefeller Institute have done an enormous amount of work in exposing rats, guinea-pigs, and dogs to X-rays of varying character and intensity. He noted that both destructive and regenerative effects upon the cell elements were recorded.

'Russ, Chambers, Scott, and Mottram (1919), in the course of experimental work with small doses of X-rays, showed that if the exposures were repeated at intervals of about fourteen days, an immediate leucopenia occurred, but with lapse of time and repeated exposure the number of lymphocytes was markedly increased—even to four or five times the original figure.

'Passing to the more purely clinical side of the question, in 1911, Jagie,

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Schwarz, and V. Siebenrock published their observations on four cases of lymphatic leukaemia, occurring in radiologists. Since then there have been a number of cases of aplastic anaemia and of leukaemia reported as due to radiation, either by X-rays or from radium.

'Aubertin (1912) investigated the blood of sixteen radiologists, all of whom had worked for several years, and none of whom had suffered from any obvious X-ray injury.

'Beclere (1912), investigating the blood of eleven X-ray workers who had been occupied for various periods from one to sixteen years, found somewhat different results. Only one case of apparent mononuclear increase with corresponding decrease in the polynuclear cells was observed. In two of the cases, however, there was marked anaemia, eosinophilia sometimes reaching seven to eight per cent., was noticed in some cases.

'Portis (1925) carried out researches on the blood of X-ray workers for over a year and, though in the main agreeing with Aubertin, concluded that alterations in the blood picture, consequent on radiation, were far from uniform. He found that the most frequent change was a progressive diminution—sometimes very distinct—in the number of white cells.

'Pfahler (1922) undertook an exhaustive investigation, addressing a questionnaire to one thousand American radiologists, including commercial firms engaged in the preparation of radioactive materials. The chief alterations, which Pfahler was able to find in X-ray workers as the result of his inquiries, was a reduction in the number of leucocytes, with relative increase in the lymphocytes, and eosinophilia, sometimes well marked.

'Since 1921 Lavedan has carried out extensive researches upon the personnel of the Institut du Radium at Paris. Both X-ray and radium workers are included in his survey.

'The conclusions of Lavedan, based upon periodical examinations of X-ray workers at the Institut du Radium and upon some radiologists working outside, were as follows:

'Blood changes are found, if not constantly, at all events frequently, in persons working with X-rays and especially in those occupied with high voltage therapy. The most usual change is an increase in the mononuclear count, which may be either absolute or relative."

Dr. Maisin of Belgium, under "Foreign Letters," J. A. M. A., May 25, 1935, in considering the morphologic changes in the blood of radiologists says:

"The circulating blood is not easily affected by radiations. The circulating blood in the ears of the rabbit may be irradiated for several hours without evidence of changes in the blood. On the other hand, the hematopoietic organs are very sensitive to radiations. One observes most frequently irritation of the red marrow. A permanent inversion of the white cells is observed at the same time. If the irradiations are continued they eventually affect a persistent mild anaemia,

with inversion of the blood picture in favor of the mononuclears; then the anaemia becomes more marked under the effects of the rays and finally takes on an aplastic form. As a rule, death intervenes with a purpuric syndrome and a noticeable diminution of the blood platelets.

'The question arises as to where, in this blood picture, leukemia belongs. Leukemia must be regarded as a reactional condition due to an irritative state, whether of the lymphoid type, the myeloid type or the Blumenthal type, in which an augmentation of the red cells and of the white cells is observed.

'Two Belgian radiologists have died from leukemia. Nevertheless, the leukemias are relatively more rare than the aplastic anemias. Recent statistics show that twenty-five per cent. of the radiologists are affected with lymphoid leukemia.

'Leukopenia is the most grave sign. It may disappear with suitable rest and proper precautions. Mononucleosis is of less importance. It may develop sometimes after only a few weeks of professional practice and it has a tendency to be permanent. A suspension of practice for two months does not re-establish the normal blood picture. It does not develop in all persons, its appearance being due to an individual susceptibility. It may disappear during infections and reappear later in a graver form.

'Polyglobulia is found in young radiologists who are normally exposed and in elderly radiologists who have been slightly exposed over a long period of time. The highest figure was 6,300,000 erythrocytes. Young types are lacking. If the person affected takes a rest, the figure will frequently drop to five or four million and will sometimes go below normal."

In discussing this vocational hazard with Dr. I. Hirschfeld he writes me as follows:

"I had occasion yesterday to discuss this matter with an internationally known roentgenologist, Dr. Gustav Bucky. Dr. Bucky told me that the technicians in his X-ray clinics in Germany were required to have a blood count made regularly, at intervals of about four months, and when they developed a "Lymphocytosis" or leukopenia, were sent away on a four or five weeks' vacation. Indeed, I understand that this procedure was followed through as a matter of law."

According to Bell, E. T., Text Book of Pathology, "Radiations produce a disintegrating effect upon the cells of the blood. The effect of the exposure varies with its duration, the amount of filtration, the voltage, the target skin distance, the sensitiveness of the individual and the tissue that is being radiated. The blood forming organs, bone-marrow, lymph nodules, spleen, thymus and the gonads are the most sensitive."

Thus far our examinations reveal a leukocyte picture as follows:

LEUKOCYTE COUNT

NORMAL	EXAMINATION	
Leukocytic count per c.mm. of blood 6,000 to 9,000	Normal	65.0%
	Above normal	24.0%
	Below normal	11.0%
Lymphocytic count per c.mm. 1,200 to 2,700	Normal	48.0%
	Above normal	52.0%
	Below normal	0%
	Above 4,000	12.5%
Lymphocytic count per cent, 20% to 30%	Normal	27.0%
	Above normal	73.0%
	Below normal	0%
Polymorphonuclears per c.mm. 4,000 to 6,000	Normal	52.5%
	Above normal	15.0%
	Below normal	32.5%
Polymorphonuclears per cent, 55% to 65%	Normal	47.0%
	Above normal	23.5%
	Below normal	29.5%
Eosinophiles per cent, 1% to 3%	Normal	72.0%
	Above normal	9.5%
	Below normal	18.5%

ARNETH DIFFERENTIAL COUNT OF THIRTY-NINE DENTISTS IN PHILADELPHIA

	TYPE I	II	III	IV	V
Normal	10	25	47	16	2
Dentists Average	26.37	39.15	27.52	6.54	.42
Highest Shift	52				
Lowest Shift	11				

Twenty-seven out of thirty-nine had no Type V. Cells

Normal weighted mean (vd. Cook & Ponder) variation 2.45 to 3.15.
Abnormal shift to left when weighted mean is below 2.45.
Abnormal shift to right when weighted mean is above 3.15.
Six out of thirty-nine examined, weighted mean normal.
Thirty-three out of thirty-nine, weighted mean below normal.

SUMMARY

LEUKOCYTIC COUNT: The examination of seventy-five men in other walks of life would reveal a leukocytic count within the limits of the findings in this investigation, and is therefore regarded as normal.

EOSINOPHILES: We would expect to find such a variation in the number of eosinophiles in the examination of the same number of men of any class. This count we also regard as within the normal limits.

MONOCYTES: The monocytic count, not tabulated, was within normal limits.

LYMPHOCYTES: The actual increase above the normal of 2,700 lymphocytes per c. mm. of over half of the dentists examined, and with one-eighth of the number having an actual count above 4,000, seems to justify the calling of the profession's attention to the seriousness of the effect of radiation, and the necessity of taking every precaution in preventing contact with rays. (Lead screens, etc.)

POLYMORPHONUCLEARS: In the normal range of from 4,000 to 6,000 polys per c. mm. of blood we would not expect to find one-third of the dentists with an actual neutropenia, as shown in this series. The outstanding facts in the neutrophilic count is the number of young cells, as indicated by the Arneth differential count. The average Type I cell being 26.37% or 16.37% above normal, the Type II cell, the next youngest count, shows 14.15% above normal. This increase is at the expense of the more mature cells, Type III, IV and V.

We would expect with this left shift an actual increase in the neutrophiles as is usually found in some infections. However, the picture in some respects is similar to that found in typhoid, that is, a left shift with a neutropenia. There is this difference, however; in typhoid fever there is a varying per cent. of toxic cells in which the cytoplasmic change, as indicated by the staining qualities of the cytoplasm varies from a normal eosinophilic pink to a dirty gray or blue. Our examination reveals a normal cytoplasmic staining.

We are indebted to Dr. Meranze, Director of Laboratories of Mt. Sinai Hospital, Philadelphia, for the examination of a number (19) of slides to determine the degenerative index. (Cytoplasmic change.) His report is as follows:

"As you see from the above data only an occasional smear shows findings that we consider abnormal. It would appear from these findings that the amount of X-ray exposure that these individuals have been subjected to has had no toxic influences on the neutrophiles."

The terms "shift to the right" and "shift to the left" are used to indicate the position of the increase or decrease in young or old cells respectively with the five types of cells as placed in the chart. An increase in young forms such as occurs in infection is a "shift to the left," a "shift to the right" is an increase in old or more mature forms as found in pernicious anaemia.

Two interpretations of the "shift to the left" are used in the diagnosis of disease. Arneth's system is based upon the assumption that the neutrophil picture expresses simply the interaction between substitution of young forms in the blood and destruction of old cells. This may be illustrated by the reaction in typhoid fever where as a rule there is a "shift to the left" with simultaneous neutropenia. This is explained by assuming increased destruction of neutrophiles to such a degree that no actual increase above the normal accumulates in the blood stream, despite an increased rate of production. This basic idea that

increase in actual young forms is always the result of increased production (regeneration) has been disputed by Schilling.

Schilling's interpretation of the changes in the nucleus of the neutrophil under the influence of infection is fundamentally different in one respect from that of Arneth. While Arneth's theory takes into account only a young form shift (regenerative), Schilling believes that there are two classes of shift, (a) regenerative shift, (b) degenerative shift. This contrast in theory can again be illustrated by the neutrophil changes which occur in typhoid fever. Instead of explaining the leukopenia accompanied by a simultaneous picture of increase in young forms, as an actual increased production with an even more pronounced increased destruction of neutrophiles, some of the cells are considered by Schilling as young *in form* only. The depressing effect of the toxin of typhoid fever has put a check on leucopoiesis so that the neutrophiles reach a certain point of differentiation only and the nucleus that remains fixed is a poisoned young form instead of continuing to differentiate into segmented forms. In such a case there is depressed bone marrow function accounting for the leukopenia rather than increased destruction.

Weighted Mean

The more the shift to the left, the lower the weighted mean; the more the shift to the right, the higher the weighted mean.

Any shift showing a weighted mean less than 2.45 or more than 3.15 is considered outside the range of normal variation (vd. Cook & Ponder, page 70).

In the examination of thirty-nine Philadelphia dentists, six were within normal limits, thirty-three had a shift to the left indicating either a regeneration (Arneth), or degeneration (Schilling) of the neutrophiles.

As the sensitiveness of the individual to radiation is exemplified in this investigation, it would be advisable for those making X-ray exposures to have a complete blood examination made to ascertain to what extent, if any, they are sensitive to the rays.

Repeated exposures may in time sensitize the blood forming organs, which fact would be revealed by periodical examinations. Those who find that they are sensitive to radiation should have frequent examinations in order to cope with possible danger.

The blood examination for diagnostic purposes in one showing a blood picture, as the majority of these examinations show, would be misleading unless the known abnormal picture was considered. It would be well from this standpoint that every dentist should know his abnormal-normal picture. All examinations should be made in the morning, as nervous fatigue following the day's work produces an entirely different picture, as exemplified in the following hemogram of an examination taken at nine o'clock, in the morning, and one taken at five o'clock, in the afternoon.

HEMOGRAM

Ery	Leuk	Bas	Eos	Stab	Seg	Lymp	Mono
Examination 9:00 a. m.							
5,100,000	8,600	1%	1%	8%	40%	47%	3%
Examination 5:00 p. m.							
5,000,000	7,500	0%	1%	10%	28%	60%	1%

International Association For Dental Research: American Division

On the Meeting for Advancement of Dental Science: St. Louis, January 4, 1936

By WILLIAM J. GIES

Secretary, American Division, International Association for Dental Research

THE American Association for the Advancement of Science bears to "organized science in America" a relation analogous to that of the American Dental Association to "organized dentistry in America."

The American Division of the International Association for Dental Research was recently made an *affiliate* of the A. A. A. S., with an elective representative in the Council. No other dental body had previously been given this recognition, although beginning in 1931 the American College of Dentists, the American Association of Dental Schools, and the American Dental Association had successively been admitted to the relation of *associate;* and they also will doubtless soon be made affiliates. These four dental bodies now constitute the subsection of Dentistry in the A. A. A. S. Dr. T. J. Hill, Dental School, Western Reserve University, is the representative in the Council.

The meeting in St. Louis was *historic* not only because it initiated *intimate* relations between dentistry and the "family of the sciences," but also because, for the first time in dental history, four national bodies coöperated closely and effectively for the advancement of dental research.

The meeting was preëminently successful; was equal to the best in any field of science; and deserves special mention because of its constructive spiritual influence, present and future, within dentistry—and upon lay respect for and appreciation of dentistry. *The soul of dentistry is marching on!*

632 West 168 St.,
New York City.

The Survey of the Dental Curriculum*

By L. E. BLAUCH

IT IS a distinct pleasure to me to tell you about the curriculum study which has recently been completed by the American Association of Dental Schools. You are an important and influential group whose efforts are doing much to promote dental health and the dental profession. Moreover, there are evidences that you are interested in the training of men and women for the practice of dentistry.

May I say at this time that we sincerely appreciate your courtesy in publishing statements from time to time regarding our work? Recently we sent copies of our report to all of you who have manifested a desire to review it in your journals. Your reviews have shown an understanding of the curriculum study, and they will help to inform the dental profession regarding it.

Origin and Purposes of the Study

Three important developments gave rise to the curriculum survey. The *first* of these was the changing point of view of dentistry. Dentistry in the past consisted principally of restorative services, and dental education was aimed principally at developing in the students proficiency in providing dental restorations for patients. Owing to important clinical observations and research studies made during the past quarter of a century dentistry has come to be recognized as a health service. This point of view imposes important new obligations on the dental profession. Leaders in the training of dental students had come to realize that dental education should be adjusted to the changing concept of dentistry in order that the profession might assume its responsibilities for maintaining the health of the people.

Second, a considerable amount of confusion had arisen in dental education because of the variety of curriculum plans which had been developed. One group of dental schools had four year curriculums based on one year of college study, another group had three year curriculums based on two years of college study, and a third group had four year curriculums based on two years of study in college. This situation hampered the discussion of dental education and it stood in the way of progress. It seemed advisable to come to some understanding as to what plan was best adapted to the education of dentists.

Third, during the past quarter of a century new methods had been devised for the study of educational problems. These techniques were evolved principally in the schools of education of our universities. They were first applied to the study of elementary and secondary education, but soon the fields of higher and professional education felt their impact. As early as 1910 the Carnegie Foundation for the Advancement of Teaching published the results of an epoch making investigation of medical education in the United States and

*Read before the American Association of Dental Editors, New Orleans, La., Nov. 2, 1935.

Canada, conducted by Abraham Flexner. Very soon thereafter a number of dental educators in the Dental Faculties Association of American Universities requested the Carnegie Foundation to sponsor an investigation of dental education similar to the one on medical education. Not until 1922 did the Foundation respond. At that time it decided to undertake a survey of dental education in the United States and Canada, and it appointed Dr. William J. Gies to carry out the project. The comprehensive report, which was published in 1926, has had a great effect in clarifying the issues in this important field of professional education. It suggested that attention should be devoted to the content of the dental curriculum and methods of dental teaching.

During the next few years the American Association of Dental Schools heard discussions of the scientific methods of curriculum study, and in due course of time it decided to undertake an extensive survey to determine what should be taught to train men and women for the practice of dentistry. The Carnegie Corporation of New York was approached for financial support and that body provided a generous sum to defray the cost of the project. The Association then appointed a committee of five deans of dental schools to have the study in charge and to report to that organization. The Curriculum Survey Committee selected two educationists as advisers and it employed another educationist, the writer of this paper, as executive secretary to devote full time to the work. An office was established at the Northwestern University Dental school and the project was put under way.

The Plan of the Survey

The plan for making the Survey is easily described. It consisted of three parts. First, an effort was made to obtain a comprehensive view of the oral health conditions of the people and the resulting responsibilities of the dental profession. On the basis of this understanding the objective of undergraduate dental education was outlined. Second, with the assistance of dental teachers, the subject matter and experience to be included in the various courses were determined and outlined. Third, the courses were arranged in a dental curriculum, the requirements for admission to dental schools were studied, and recommendations were prepared regarding policies and plans for dental education. Such in brief was the scheme followed. It is readily described but the execution required much painstaking effort and time.

Problems Related to the Survey

The Survey was confronted with a number of interesting and perplexing problems. The procedure to be followed was one of these. Over a period of years a number of useful educational techniques had been developed and used to good effect. Those which appeared to be suitable were employed and others were evolved as occasion required. The financial resources at the command of the Committee, the status of dental education, and the problems confronting dental educators were factors in the selection of the methods used in the Survey.

The Survey was confronted with conflicting views regarding dentistry and

dental education. One view, a conservative one, was that dentistry was primarily and essentially a restorative service and that practitioners do their work in much the same way as the craftsman plies his trade. A training somewhat comparable to that for engineering, though neither so complete nor exacting, with a smattering of biology would be sufficient, it was thought, to train men and women to practice dentistry on this limited basis. At the other extreme were those who wished to regard dentistry as a branch of medicine, and some went so far as to advocate a full medical training for men and women who aspire to be dentists.

The situation referred to raised the question as to what kind of services the dentist should be prepared to render; should it be very limited and essentially restorative and mechanical in character, or should it be comprehensive with a broad health outlook. The conclusion regarding this matter was based on the fact that the dental profession is to a large extent responsible for both the oral and the general health of the people and that it should have a broad scientific outlook and be capable of rendering directly a comprehensive oral health service and indirectly a service to the general health of patients. This conclusion has wide implications, more than many persons now realize and perhaps more than some dental educators are willing to accept. It means that the dentist of the future should be trained in dental school to render all types of oral health service and to deal with all problems of oral health except those which present unusual difficulties the management of which require extended training and wide experience.

In keeping with progressive trends in dentistry, dental education should be definitely oriented toward health service. The possibilities and obligations of the profession for the maintenance of physical and mental health are paramount, and dental students should be trained to discharge adequately the duties of the profession in these matters. Moreover, this ideal is not to be regarded as a mere veneer, it should run all through dental education and motivate all its efforts. A dean of a dental school has recently characterized the dentistry of the future very aptly as "a phase of preventive medicine".

The place of restorative service in dentistry and proper training for it presents a problem. Some dentists and dental educators have become so profoundly interested in the health aspects of dentistry that they have tended to undervalue the restorative treatment made necessary in many mouths by the ravages of dental diseases. In particular, they have tended to underestimate the importance of the mechanical procedures by means of which dental health is maintained. The conclusion reached by the Survey was that the restorative service of dentistry should be greatly improved and that dental education should offer a progressively improving training in this field. It should be placed on a more scientific basis than is now too commonly found.

Instruction in the sciences has long been one of the difficult problems in dental education. A number of the sciences have been in the dental curriculum

since the beginning of dental schools, but the purposes of instruction were not clearly formulated. There was a feeling that these subjects belonged in dental education, but not until recently was the role of the sciences in the education of dentists clearly demonstrated. It has now become apparent that the practice of dentistry in the future must rest on a solid foundation of science.

The teaching of the sciences in the dental curriculum is confronted with several puzzling problems. Some of the older teachers of clinical dentistry have had little or no scientific foundation and they are unable to apply the sciences in their instruction. In some instances the teachers of the sciences have not measured up to their responsibilities. They are usually either graduates in dentistry or men who have been trained in the sciences but have little understanding of dental problems, and all too frequently, little concern about them. Teachers of the former type, unless they have made special and adequate preparation in science, are apt to give courses which are very elementary in character and possess little value; teachers of the latter type are apt to offer courses with little or no regard to their special functions in dental education. The demand is clearly for courses in the sciences which are adequate in quality and quantity and definitely related to the objectives of dental education. For the teachers of the sciences to insist on making anatomists, chemists, physiologists, and histologists of dental students when the objectives of those students are to become competent dentists is to waste time and effort that could be used to better advantage. The objectives of the teachers of the sciences and the objectives of the dental students should be the same. Fortunately this matter is now being squarely faced and constructive thinking is being done on it, with the result that subject matter is being developed which is well adapted to the attainment of the purposes of dental education.

The Survey attempted to outline instruction in the sciences that would be definitely related to dentistry. The subject matter was planned rather specifically to develop a basis for understanding the clinical subjects. We do not claim that this problem has been fully solved, but we are of the opinion that a sound beginning has been made and that from it the teachers can greatly improve the science courses in the dental curriculum as they acquire experience in adapting their instruction to the needs of dentistry.

One of the relatively untouched fields in dental education is that of the social and economic relations of dentistry. True enough, a number of dental schools have offered courses in the history of dentistry and others have given instruction in the management of private dental practice, but the broader relations of the dental profession to society have been rather generally neglected. In the social and economic upheaval during the past five years there has been much study of the functions of the professions, particularly of the health professions, and their proper relations. The training of dentists in the past has not generally prepared them to deal in a comprehensive way with these matters. The Survey

concluded that dental students should be trained to understand the place and function of the health profession, particularly the dental profession, in our society, to understand the background of the social and economic problems in the efforts to provide health service for all the people, and to coöperate in the solution of the social and economic problems involved in providing health service. To this end, a substantial course was suggested to cover these matters.

Another problem of concern to the Survey was the preliminary college education of dental students. This question has generally been approached primarily from the point of view of the relation of this preliminary education to the strictly professional training. When it has been discussed, the argument has usually turned on the foundation, more or less specific, for the mastery of a professional curriculum. In the Survey the question was approached largely from the point of view of the direct connection of the student's general education with the later practice of his profession and his social and civic responsibilities. This broad point of view led the Curriculum Survey Committee to recommend that two years of college study, or the completion of the junior college course, should be required for admission to dental schools. It also resulted in the conclusion that these two years of college work should be general rather than "pre-professional" in character and that dental schools should not lay down subject prescriptions beyond those that are absolutely essential. The Committee recommended that only two subjects, biology and inorganic chemistry, be required for admission to dental schools. Although these recommendations were adopted by the American Association of Dental Schools, recently there has been a considerable amount of discussion regarding the second one. Just what will be the final agreement is not at the moment certain.

The Curriculum resulting from the Survey is not regarded by the Committee as a final course of study. In a dynamic social order no curriculum should ever be regarded as final. A course of study is scarcely finished when new discoveries and new visions make changes necessary. The goals of education are not static and fixed; they are in a constant flux, and educational programs must undergo continual adaptation. Perhaps in due course of time after much intelligent experience with the new curriculum and full discussion of its features, the American Association of Dental Schools may find it advisable to undertake a thorough revision. In the meantime the report of the Committee is stimulating much discussion of the problems of dental education. And dental education and the dental profession of the future will be the better for it.

Continued Work of the Survey Committee

The Curriculum Survey Committee had hardly begun its work when it was made to realize that the undergraduate course of study is only one of several major problems of dental education. However, it seemed best to concentrate on the course of study and complete it in the expectation that additional resources might be obtained to undertake other studies later. The Carnegie

Corporation in December, 1934, made a grant to enable the Committee to continue its work.

Plans have been made to study methods of teaching dentistry, and this project has been put under way. It will require two years and the report will be a rather extensive discussion of the principles of teaching and teaching procedures with application to the problems of teaching in dental schools.

[*The generous attitude of the Committee on Curriculum Survey toward constructive criticism has continuously been such as to encourage us to believe that it will welcome the following paper by Dr. Arthur H. Merritt, which was written by request. Many periodontists are in complete agreement with Doctor Merritt's observations.—Editor.*]

The Report of the Curriculum Survey Committee with Special Reference to Periodontology

By ARTHUR H. MERRITT, D. D. S., F. A. C. D., F. A. A. P.
New York, N. Y.

IN THE past decade there have been two great epoch making events in the evolution of dentistry: one, the survey of *Dental Education in the United States and Canada* by Dr. William J. Gies under the direction of The Carnegie Foundation for the Advancement of Teaching: the second, a report of the *Curriculum Survey Committee* in which many changes in the present dental course are suggested. Both surveys were made possible by a grant from the Carnegie Corporation. The value of these two contributions to dental progress cannot be over-estimated. The dental profession and the public owe a debt of gratitude to those who made them possible. Both are beneficiaries of their public-spirited efforts.

The report of the Curriculum Survey Committee follows as a logical sequence to that made by Dr. Gies in 1926. It is an earnest attempt to give form to some of the recommendations contained in his study of dental education. It is an important step in the right direction, even though as stated by the Committee, "It was not the intention of those engaged in this study to present a *final* curriculum in dentistry." In the nature of things this would be impossible inasmuch as "no course of study, however well it may be designed or however solid may be its foundations, can ever be final."

An important service, however, which the report should render, and one recognized by the Committee, is that of encouraging discussion of the course of study as outlined. Indeed, the hope is expressed "that these discussions will help to clarify some issues and state others in such a way as to facilitate further discussion." With this in mind it may not be inappropriate to examine some of

the recommendations made in the report regarding periodontia, with a view to "further discussion" of the problems involved. In doing this no criticism is intended. No one appreciates more than the author the difficulty of the task undertaken. The surprising thing is that it has been done so well. It should be an encouragement and inspiration to every member of the dental profession. It is in this spirit that the following queries are made:

1. What is the logical place of periodontia in the general practice of dentistry?
2. Is it receiving the attention of dental educators which its importance deserves?
3. Are the provisions made in the *Report of the Curriculum Survey Committee* adequate to meet the needs of undergraduate instruction in this field?

In attempting to answer the *first* of these questions it will be necessary to consider briefly the relative frequency of the diseases affecting the teeth and the part which these play in their loss. There is no better way in which to obtain a true picture of the situation.

Diseases affecting the teeth might be arbitrarily divided into two groups: (a) those which affect the teeth directly, such as caries, erosion, hypoplasia, etc., and (b) those which affect them indirectly, through their supporting tissues, of which periodontoclasia and periapical infections are conspicuous examples. Curiously enough, the dental profession from its earliest beginnings down to the present time has given itself almost exclusively to the control of diseases in the first group. In so doing it has evolved an elaborate system of repair and replacement which has made American dentistry a synonym for excellence throughout the world. For this it is to be commended. But unfortunately it has done this with an almost complete disregard for that group of diseases which involve, and in many instances destroy, the supporting tissues of the teeth. This refers especially to gum recession, gingivitis, Vincent's infection and periodontoclasia. Yet these diseases, plus periapical infections, are responsible for the loss of fifty-seven per cent of the teeth of our patients, while caries accounts for a loss of only twenty-six per cent. The figures as given by Brekhus are: caries twenty-six per cent, periodontal diseases thirty-two per cent, and periapical infections twenty-five per cent.[1]

How, under these conditions, can the dental profession justify itself in giving ninety per cent of its attention to the treatment of dental caries and only ten per cent to the treatment of diseases causing the loss of more than twice as many teeth.[2] May not this lack of care be the explanation for this enormous loss? Why, it might be asked, should we as a profession, continue an elaborate and costly technique for the repair of teeth when thirty-two per cent of them will eventually be lost through neglect to care for the tissues which surround and support them and twenty-five per cent from periapical infection. Is this not placing the cart before the horse?

To continue to do so is, to say the least, illogical. If a chain is no stronger than its weakest link, then the efficiency of dentistry to preserve the teeth of the public, must be measured by the success or failure of its efforts in the field of periodontology. Periodontia cannot be relegated to a subordinate place in either undergraduate instruction or in daily practice, if dentistry is to measure up to its responsibilities as a health service profession.

Second: *Is periodontia receiving the attention of dental educators which its importance deserves?*

It is a known fact that the graduate in dentistry, except in very recent years, received little or no undergraduate instruction in periodontia. The result is that he has engaged in the practice of his profession only partially equipped to meet the needs of his patients. Unless he has made up this deficiency by post-graduate study (which very few have done) he will in most instances, give little or no attention to this aspect of his practice—certainly none that is adequate to the needs of those who patronize him. Is it any wonder then, that under these conditions, the Committee found that "dentists hold different views as to the value of (periodontal) treatment, some maintaining that for many cases the treatment is efficacious, while others maintain that satisfactory results cannot be attained." And yet the Committee found in its investigation "in 1929 that 89 per cent of dentists in general practice included the treatment of pyorrhea in their service."[3] One should not be surprised that these "dentists in general practice" with probably very little undergraduate instruction in periodontia should "hold different views as to the value of treatment" or that some of them reported "that satisfactory results cannot be attained".

The responsibility for this unfortunate situation is primarily that of the institution from which the dentist is graduated. In its failure to provide instruction in periodontology, it has not only failed in its responsibility to the student but has, at the same time, created in him a wrong impression by placing the emphasis on the mechanical rather than on the biological phase of dentistry where it logically belongs. It is not to be wondered at, therefore, that the Committee found that these conditions "tended to make the treatment of these (periodontal) diseases incidental in dentistry".

Nor is the present condition in undergraduate instruction greatly improved. In a recent survey of the subject in which the catalogues of thirty-four dental schools were studied, it was reported that "the information gleaned from them confirmed the impression given by the Survey that the evaluation of periodontia in the average undergraduate curriculum is far from commensurate with the importance of the subject. In ten of the catalogues, there was little or no mention of periodontology either in the faculty, or the schedule, or the description of courses of study." It is further stated that "the reason for the neglect of periodontal pathology by practitioners of dentistry is largely the fault of inadequate teaching".[4]

The first step, then, in the correction of an unfortunate situation in dental

education must be taken in the dental schools. And this will not be done until there is a deeper appreciation on the part of our dental educators of the place which periodontology logically occupies in the practice of dentistry.

Third: Are the provisions made in the Report of the Curriculum Survey Committee adequate to meet the needs of undergraduate instruction in this field?

In the report as made by the Committee, periodontology is grouped with "Diseases of the dental pulp and periapical tissues" and "Lesions of the lips, cheek, and tongue and other diseases of the mouth which do not require surgery", under the head of *Oral Medicine*. The time allotted to *Oral Medicine* in the report as compared to Orthodontia for example, is as follows:

	Clinical Hours	Laboratory Hours	Class Hours
Oral Medicine:	180-200	33	38
Orthodontia:	240	60	64

In the hours allotted to *Oral Medicine* the following subdivisions are made:

Diseases of the dental pulp, etc., pre-clinical instruction, 6 class hours and 33 laboratory hours; in the clinical years, 11 class hours. No preclinical instruction is given in periodontology but it is allotted 15 class hours during the two so called clinical years. In the three courses, Oral Pathology, Diagnosis and Preventive Principles in Dentistry given during these clinical years, 16 class hours relate to periodontology. These 16 hours added to the 15 class hours assigned under Oral Medicine would supply but 31 class hours out of a total of 608 class hours of the two *final* years of dental education in which to impress the student with the relative importance of periodontia. The balance of the class hours assigned to *Oral Medicine* during these years are given to the subdivision of Diseases of the lips, cheek, etc.

It will thus be seen that periodontia as a *specific* subject is given but fifteen hours of class instruction. How many of the 180-200 clinical hours given to Oral Medicine are allotted to periodontia, is not specified. The two groups of diseases, therefore, which have been shown to be responsible for the loss of fifty-seven per cent of teeth, are together given but thirty-two hours of class instruction, as compared with sixty-four hours in the single subject of orthodontia, not to mention the time given to all the other subjects included in the dental curriculum. And this is done, notwithstanding the fact that periodontia is so fundamental to the practice of dentistry that eighty-nine per cent of general practitioners reported that they felt it necessary to include it in their practices, whereas less than one third included orthodontia.

In making these observations it is not to say that too much time is given to other subjects in the curriculum as outlined by the Committee, but to give emphasis to the lack of appreciation on the part of our dental educators of the place which periodontology should occupy in dental education. It is to be hoped

that with the evolution of dental education, there will come a keener sense of the importance of periodontia and the part which it plays in the successful practice of dentistry. Until then we need not be surprised at being informed that periodontal diseases are responsible for the loss of more teeth than dental caries or periapical infections, or that the emphasis which has been placed upon mechanical procedures in our educational institutions, has tended to make the treatment of periodontal diseases *"incidental in dentistry."*

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580 Fifth Avenue.

A Course of Study in Dentistry: Report of the Curriculum Survey Committee, American Association of Dental Schools.

A careful reading of this book is an essential part of every dentist's post-graduate education. Whether or not one agrees with the conclusions reached by the Committee and the Curriculum outlined, he is bound to recognize the immensity of the task undertaken and appreciate the thoroughness with which it was done. Dentistry is much indebted to those who made the survey and also to those who made it possible.

It is understood that the study is to be continued further, and if this be the case we can but hope that a larger proportion of time in relation to other subjects in dentistry be given to the evaluation of prevention and treatment of periodontal lesions in the dental curriculum.

Twenty-third Annual Meeting

THE American Academy of Periodontology urges the members of the American Dental Association to attend the scientific sessions of its Twenty-third Annual Meeting at the Palace Hotel, San Francisco, California, on July 9, 10, and 11, 1936.

Dr. Rudolph Kronfeld, Chicago, Illinois, as chairman of the Committee on Scientific Investigation has secured some excellent contributions.

Dr. Carlos Schott, Cincinnati, Ohio, is chairman of the Program Committee.

Dr. Edward L. Ball, Cincinnati, Ohio, and Dr. C. J. Caraballo, Tampa, Florida, have selected the clinics.

Dr. Arthur H. Merritt, New York City, has obtained several brief contributions under the general title of "Incidents of Office Practice."

There will be a Round Table Discussion Luncheon as usual and the banquet on Friday evening, July tenth.

Attend this meeting and encourage those who are making an effort to reduce the number of teeth lost from periodontal diseases.

"How can the dental profession justify itself in giving ninety per cent of its attention to the treatment of dental caries and only ten per cent to the treatment of diseases causing the loss of more than twice as many teeth. May not this lack of care be the explanation for this enormous loss? Why, it might be asked, should we as a profession, continue an elaborate and costly technique for the repair of teeth when thirty-two per cent of them will eventually be lost through neglect to care for the tissues which surround and support them and twenty-five per cent from periapical infection. Is this not placing the cart before the horse?

"To continue to do so is, to say the least, illogical. If a chain is no stronger than its weakest link, then the efficiency of dentistry to preserve the teeth of the public, must be measured by the success or failure of its efforts in the field of periodontology. Periodontia cannot be relegated to a subordinate place in either undergraduate instruction or in daily practice, if dentistry is to measure up to its responsibilities as a health service profession." See page 44.

Periodontia is an essential part of the correct practice of dentistry.

Haidee Weeks, President,
1203 Maison Blanche,
New Orleans, La.

Instructions to the Patient*

By Walter Leabo, D. D. S., Shreveport, La.

There is something inherently difficult in assigned subjects, especially when they actually appear so simple and pertain to the daily commonplace routine of our professional lives, as does the topic of Instructions to the Patient. We take these matters more or less for granted, something in which we are all expected to be well versed. But when we come to analyze the subject in point, it is interesting how our individual ideas may assert themselves. The rules have more or less been laid down for us and standardized as well, yet I venture the assertion that could each of us hide behind the laboratory door, and listen to the ideas of twenty-five of our professional brothers as expressed to their patients in the privacy of the operating room, in their endeavor to educate their patients in the knowledge and coöperation essential to the successful care of periodontal diseases it would furnish a lesson far beyond the possibilities of the study of rules and accepted methods of procedure.

We are bound more or less by certain established principles, changing of course with the times, but we are all governed largely by our own lines of thought which the years have directed along channels dredged out by experience and observation. Most of us unconsciously become fair psychologists after years of practice in a profession such as dentistry, and we learn that what will impress one patient will go in one ear and out of the other with the next one. So we must depend upon our own judgment to guide us.

Here is a real opportunity for the dentist to win the confidence and coöperation of his patient, by the manner in which the problem is approached, and the explanations and instructions given.

Things done over and over become a habit, and so we may look upon our instructions to the patient as a sort of habit, but it pays to check up occasionally on this habit in order that it may not become so routine as to lose its force and effectiveness.

I believe it is more interesting to most of us to spend an hour in correcting occlusion or curetting in a periodontal pocket than to spend the same time in instructing the patient. I believe the latter requires more concentration of mind and energy, and takes more out of us in the way of nerve exhaustion. Certainly each one of us has the opportunity to put more of himself into this phase of our work than possibly any other which directly concerns the patient.

Instructions to the Patient. What a comparatively simple subject this seems, but I can think of no phase of periodontia other than the ability to accomplish good operative results, of more importance. Hundreds of failures in the hands of otherwise thoroughly competent operators can be traced to lack of simple plain explanations of the common problems of patient and periodontist. In a narrow sense, instructions to the patient, may be easily interpreted to cover simply the matters of toothbrush technique, use of mouth wash or other agents in specific cases, dental floss and inter-dental massage instruments of various kinds. This, in fact, is only a small part of the problem.

It is amazing in this age of progressive dentistry to note the number of intelligent patients encountered who have the most vague ideas of the disease which they know only as "pyorrhea", and this despite the fact that they have had dental service, often at regular intervals, for many years. It is equally surprising to many patients to suddenly discover, that in spite of their diligent efforts, they have become the victims of the very disease they have so long dreaded.

It is not only a matter of instruction, but also of answering the hundred and one questions, which to us seem so elementary, but which we must realize are very real and important to patients. They must know through a simple common sense ex-

*Read before the American Academy of Periodontology at its 22nd annual meeting, Friday, Nov. 1, 1935, New Orleans, La.

planation why the tissues supporting the teeth have been partially or completely destroyed; that they are not pariahs suffering from a condition which sets them apart as one in disgrace. Is this not a common belief of many? It is of small avail to explain causes, effects and treatment in technical terms, since it is merely confusing to the average person. The explanation should be presented in a manner and in such terms as will appeal to the reason and direct the thoughts of the patient in a practical way to the solution of his problem.

Among the important discussions with the patient are the biologic ones of function, nutrition, poor circulation of blood, poorly nourished supporting tissues, irritation of the gingival tissues and subsequent infections. This should be done, however, without resort to technicalities. Gradually the way is paved for introducing the ways and means of eliminating the existing diseased conditions, the importance of, and reasons for, the use of the toothbrush and other means of producing necessary cleanliness and stimulation of circulation; also the necessity of regular prophylaxis, what its objective is and how this service should be performed.

In order that our instructions may appeal to the intelligent patient, it is obvious that we must first have a clear idea in our own minds of just what we wish to convey. To do this, we have first to do some straight thinking and reasoning for ourselves. No professional man can instruct the layman in matters of health and disease convincingly by merely parroting time-worn phrases. It is hard to convince a thinker that a disease as universal as periodontoclasia, is merely a matter of uncleanliness. He has probably tried all of his life to keep his teeth and dental tissues in good health by scrubbing, only to find it of little avail.

The problem of periodontal disease is similar to that of all degenerative diseases affecting the gastro-intestinal tract and associated organs. Perversion of function, resulting from refined, demineralized, devitalized and de-vitamized foods, or as Mendel of Minneapolis has so aptly said "the adulterated and often poisoned pap of civilization," is possibly our greatest error; however, the average human being today suffers almost as much from lack of fresh air and sunshine, to say nothing of the constant high pressure living which modern economic conditions have made necessary in order to obtain the God-given rights of food, shelter and clothing. These are some of our basic problems in instructing the patient. It is not at all such a simple matter as teaching the technical care of the mouth and dental tissues, but we have a wonderful opportunity through the hours we spend with our patients, to give them an insight into the fundamental factors of life as evolved by Mother Nature for the preservation of the health, happiness and contentment of the human race.

This may sound Utopian, but I firmly believe that if medicine and dentistry are to fulfill their highest destiny, it will come through the recognition and utilization of biologic laws, immutable in their action; and that the responsibility for the education and enlightenment of humanity falls squarely upon our shoulders under the caption if you please, of *Instructions to the Patient.*

706 Medical Arts Bldg.

Office Management*

By WALTER C. BRUNK, D. D. S.
Detroit, Michigan

Replies to inquiries I have made of dentists and dental patients, convince me that we are in a large measure failing to create a desire on the part of our patients for the type of service we believe to be to their best interest. That service is, of course, preventive dentistry.

At a time when dentistry seemed to be making rapid strides and preventive measures were beginning to be taught and appreciated, we were suddenly thrown into a great economic upheaval. Since then it has been difficult to regain our position and today we find an indifferent attitude on the part of both the public and many dentists.

A close view of our position reveals dissatisfaction on many sides.

The medical profession freely states that from the standpoint of focal infection, teeth stand first in importance. The public from the well to do, to the indigent, constantly complain that the cost of good dentistry is prohibitive. They are referring mostly to restorative treatment. Within our own membership, we hear repeatedly such statements as these: "The public will not pay for good dentistry today;" "Patients just will not coöperate with proper home care;" "Patients will not respond when notified to return for prophylactic treatment and mouth examination."

This critical attitude means simply that we have failed to convince our patient of the value, to him, of the reconstructive treatment we have proposed; of the benefit to him of caring for his mouth at home as instructed; or the importance to him of returning for periodic prophylactic treatment and mouth examination.

One can check the percentage of his patients who are responding to a recall system and get a clear indication as to the degree of his success in patient education. If ninety per cent of the patients are responding, the rating is high; if no more than fifty per cent this is an indication of partial failure in this respect. It seems that the success of recall depends not so much upon the method employed of notifying patients, that is by card, telephone or personal letter, as upon how successfully we have impressed the patient with the importance to him of his returning.

Our office educational program, is the very foundation upon which a successful practice can be built.

We are about to enter a period in dental history when the demand on our time will be greater than ever before. Through the efforts of our public health program, greater numbers are continuously becoming interested in dental health, and in the future will seek our services. Unless we practice preventive measures more intensively, we will see our profession reverting to a vocation of plumbers and carpenters and will find dental cripples developing faster than we can build crutches for them. Of course, in a broad sense, all restorative treatment, if it really restores health and function, is preventive treatment, but what I wish to stress is the greater value to public health, of measures that will save our younger patients, and older ones too whose teeth and mouths are still healthy, from becoming diseased.

Building an office educational program about the broad concept of prevention; devising ingenious methods for clearly visualizing to our patient just what coöperation means to him in economy, health, comfort and aesthetics; and last, but by no means least, taking sufficient time from our "plumbing and repair" operations to present our program to every patient, will do much to correct the present precarious state of our profession.

Much has been written on the value of periodic mouth examination and prophylactic treatment. Volumes have been written on the subject of home care, and much well directed criticism has resulted in the refinement of technique so that today any dentist can consult our literature and find all he may need of educational material.

Those of you who limit your work to

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periodontia have done more toward the education of patients in home care than the general practitioner, but it has been so because the very success of your treatment has demanded this coöperation from the patient. You are appreciative of the value of proper home care as a preventive measure, and because of your understanding of its importance, you are better qualified to instruct. There is no more opportune time to impress a patient with the value of his effort than when he can see the benefits of his coöperation in correcting a diseased condition of his mouth. The general practitioner who refers his patients for periodontal treatment, oftentimes misses his greatest opportunity in this respect, so in such instances it places a greater responsibility upon you. Your coöperation with the dentist who refers his patient to you will greatly aid him in meeting his obligation to the public.

It is most unfortunate that this public indifference should exist at a time when drastic social legislation is being enacted. It may not seem desirable that we become involved in political propaganda, but unless we concern ourselves with present social legislative proposals, we may be faced with enactments changing our whole system of dentistry. The leaders of our national and state organizations have done much to defeat certain vicious legislative proposals, but they have advised us that the time may soon come when the number of votes we can enlist will decide the issue. If we are to expect such support from our clientele, we must regain their personal interest in maintaining our present standards of practice; this can be accomplished most effectively by an intensive educational program presented directly to every patient in the daily routine of office practice.

8715 E. Jefferson Ave.

Acrodynia*

By H. M. KIGHT, D. D. S.
Houston, Texas

The subject of this case was 19 months old. The child was of normal habits, diet and weight at the beginning of the disease. The parents are of normal health and physical properties, and are free of syphilis and do not give history of ever having been treated for it. Living conditions are a little below the average, but they are clean and sanitary.

The etiology of Acrodynia is unknown. There have been many theories, among them arsenic poisoning, dietary deficiencies, etc. However, all of these have been disproved either entirely or in part. According to (1) Dr. Clement Cobb of New York, (American Journal of Diseases of Children, November, 1933,) only a few cases have come to autopsy; the greater majority of these examinations were made by general pathologists who were insufficiently experienced in neuropathology. I will give briefly some of the autopsy findings (1).

Brain—The brain in some cases showed practically no change while others resembled the brain of a victim of encephalitis. Drs. Kernohan and Kennedy of Mayo Clinic showed changes in the brain especially in the region of the thalmus and fourth ventricle.

Spinal Cord—The spinal cord in practically all cases showed an infiltration of small glia cells and pathological observations which satisfactorily explain disturbed function of the vegetative nervous system, with degeneration and destruction of portions of the spinal cord, particularly the lateral horns have been recorded.

Peripheral Nerves—In the majority of cases degenerative lesions of the peripheral nerves were found and in some there was considerable myelin destruction.

Sympathetic Nervous System — The sympathetic system as a rule is unaffected.

Muscles—Simple atrophy is found occasionally but not always.

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Skin—Erythema over the entire body in advanced cases particularly fore-arms, chest and lower parts of legs. Edema may be present, with reticulo endothelial proliferation of the papillary layer and corium.

Endocrine Glands—The endocrine glands are usually found to be normal. Hypoplasia of the suprarenal medulla may occur.

Lymphatic System—There is always exhibited a marked hypoplasia of the lymph nodes.

Cardio-Respiratory—Hypoplasia of the heart and aorta have been found. Tuberculosis and broncho-pneumonia are among the findings of the respiratory tract as the cause of most fatalities.

Other pathological findings include: necrosis of the mandible, sclerosis of the cranial bones, cloudy swelling of the kidneys, heart and liver; trophic ulcers of the tongue, cheeks, fingers, palms and soles.

Symptomatology-Typical

The onset may be sudden or gradual, two or more weeks being required for the disease to reach the point where diagnosis may be positive. At first there may be a low grade fever with increasing irritability, insomnia, loss of appetite and profuse sweating. Photophobia, conjuctivitis and a generalized miliaria rash often appear in the early stages of the disease. The typical appearance of the hands and feet occurs in the second or third week. They are swollen and beefy red in appearance with cyanotic erythema which is most marked at the tips of the fingers and toes; this fades out gradually and is accompanied by a painful local paresthesia. The patient loses all interest in play and will lie with his face buried in the pillow for long periods of time without moving. Weakness may become so great that the child cannot stand. Loss of appetite is common. Normal bowel function is usually found. There is a marked loss of hair. The patient will frequently pull out handsful at a time. There is a striking tachycardia with pulse ranging from 120 to 160 in a resting position. There may be a loss of normal teeth without other oral symptoms; there is usually excess salivation, gingivitis, with ulceration of the tongue and oral mucosa.

In the case that I was fortunate enough to have the opportunity to observe, the course of the disease, happened to be one of the type in which there was a very tragic oral manifestation.

When the case was called to my attention the lower incisors had been lost, the buccal and labial mucosa and the tongue presented several very large trophic ulcers. There was a marked gingivitis with loosening of some of the other teeth. Unfortunately, the oral symptoms were present before the general symptoms were recognized. Meanwhile the child was treated for Vincent's infection until the loss of teeth occurred. At this time the physician in charge felt that the case was getting out of his field and referred it to me.

Treatment

Dr. James B. Brown states in regard to the treatment of Acrodynia that, "When one observes a child with Acrodynia and realizes how little he has to offer he feels like a therapeutic pauper."

We continued Vincent's treatment for five days with no improvement. Up to this time there had been no pathological or bacteriological examination made, of the child's mouth, a fact of which I was not aware. We then made an exhaustive pathological and bacteriological study of the case including Wassermann, blood count, urinalysis, smears, cultures and biopsy. However, we were unable to isolate any organism of a positive nature. Treatment then became merely symptomatic, hexylresorcinol solution ST-37, and sodium perborate saturated solution were used to keep the mouth clean. Diet consisted of foods containing high vitamin and caloric qualities. In spite of all efforts and precautions, the child continued to lose weight and strength. Forced feeding through a nasal tube and the use of concentrated, predigested foods was then begun. (3) This was followed by immediate improvement. The disease by this time had run its course, and forced feeding merely helped the child regain its lost strength and weight.

I am happy to report that the child has apparently regained its health and is now of normal weight. Unfortunately, the time is too short to indicate the effect on the mandibular permanent teeth. The only

teeth present in the mandible at this time are the second deciduous molars. There were no maxillary teeth lost during the process of the disease.

[1]Dr. Clement Cobb, American Journal Diseases of Children, Nov., 1933.
[2]Dr. James B. Brown, International Journal of Orthodontia and Dentistry for Children, January, 1933.
[3]Dr. Frank Lancaster, Nov., 1933, Houston, Texas.

Gingivitis*

By ARTHUR H. MERRITT, D. D. S., F. A. C. D., F. A. A. P.
New York City

Diseases affecting the gingivae are as old as civilization and probably are older. The earliest writers on medical subjects, some of them dating back to the very dawn of history, refer to such diseases and prescribe their remedies (1). As might be expected such diseases are frequently met with in present day practice, the most common of which is known as gingivitis.

In an examination of five hundred individuals between the ages of twenty and thirty-five, Black found gingivitis in some form to be present in 95% of those examined (2). And when it is realized that the incidence of gingivitis increases with age, one need not be surprised at the frequency with which it is met in daily practice. And when it is further realized that the gingivae are the gateway through which other and more serious diseases gain entrance to the deeper periodontal tissue, it will be obvious that their preservation in health is a matter of no little importance. No attempt at preventive dentistry, which should be the goal of every practitioner, can ever succeed in which the health of the gingivae is not given a prominent place.

For these reasons, it is highly desirable that consideration be given to the ways and means by which the incidence of gingivitis can be controlled. In so doing one is taking the most effective step possible in the control of all periodontal disorders.

Causes of Gingivitis

A question which naturally arises in any serious consideration of the subject is: Why is it that of all the periodontal tissues, the gingivae are most frequently the seat of disease? In answering this question there are several factors to be considered which may offer some explanation of this commonly observed phenomenon.

First: The anatomical relationship of the gingivae to the other periodontal tissues. This is such that there is created a space of varying depth around each tooth, at the bottom of which the attachment between the hard and soft tissues take place. Under conditions of modern civilization this anatomical relationship has become the *locus minoris resistentiae* in the periodontium.

Second: Because of their position in the periodontium the gingivae are constantly exposed to trauma, irritation, infection and functional disturbance. This is seen in cases of food impaction, toothbrush trauma, prosthetic restorations, bacterial accumulations in the gingival sulcus, tooth loss, etc.

Third: The endo-transitory nature of the periodontal tissues by which they are abnormally sensitive to circulatory disturbances (3).

Fourth: The affinity which the gingivae seem to have for certain blood borne poisons such as arsenic, bismuth, copper, lead, mercury, phosphorus and the like.

Fifth: Their susceptibility to nutritional influences. This is evident in all deficiency diseases. In cases of avitaminosis, especially vitamin C, it has been shown that capillary permeability in the gingivae is markedly increased (4). A classic example is scurvy.

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While scurvy is infrequently seen at present in its text book form, it is undoubtedly present in milder form in many unsuspected cases.

Sixth: The effect upon the gingivae of certain systemic diseases notably diabetes, agranulocytosis, leukemia and so forth.

Classification

As might be expected from the multiplicity of factors which may induce inflammatory reactions in the gingivae, these reactions express themselves in a variety of ways, depending in large measure upon the causative factor. For this reason it is important that a differential diagnosis be made in each case as treatment will depend to a considerable extent upon the type of gingival disorder one is dealing with. In every case, a careful examination of the gingivae should be made as to their color, form and position, for no matter what type of disease may be under observation, it will affect the gingivae in one or more of these three ways.

Marginal Gingivitis

First and most common of all gingival diseases is, what, for lack of a better term, might be called *marginal gingivitis*. Just how common this type is will be evident from Black's observations as quoted above. It is most apt to occur in that region of the mouth and about those gingivae which are least accessible and therefore less well cared for. The septal gingivae in the molar regions are most often affected, with the lingual surface next in order. It is only in cases of great neglect that one finds all the gingivae uniformly involved in this type of disease. In its uncomplicated form, marginal gingivitis is purely local in origin. It is usually caused by some local irritant which may be mechanical, bacterial or chemical. The most frequent causes are oral sepsis, faulty restorations and food impaction. There is usually some change in the color of the affected gingivae which also show a tendency to bleed when pressure is applied, as in brushing. There is no pain or tenderness. This is an important point in making a differential diagnosis, for in cases of subacute Vincent's infection which it closely resembles, there is always a history of sensitiveness. Gingivitis is often associated with periodontoclasia and in many cases is undoubtedly a predisposing factor. Treatment consists of a careful prophylaxis, applications of tincture of iodine of proper strength and regular massage. In all uncomplicated cases of marginal gingivitis, such treatment is most effective if skillfully done. Its seriousness is potential rather than actual, for in all cases marginal gingivitis is but a preliminary step in other and more serious periodontal diseases. Even so slight a thing as the pressure from a chronically inflamed gingiva is sufficient to cause a resorption of the crest of the alveolar process which in turn invites pocket formation.

Hypertrophic Gingivitis

Another type of gingival disorder is that of hypertrophic gingivitis. This type of gingivitis is characterized by a more or less marked enlargement of the gingivae which take on a swollen, glossy appearance and which may or may not bleed easily. Generally speaking, the gingivae are not sensitive, unless complicated by Vincent's infection. As a rule not all the gingivae are involved, those most commonly affected being the septal gingivae. Though rarely seen in the deciduous dentition it is not uncommon in childhood and adolescence (5). Its causes may be local or systemic (6). Most common among local causes are trauma, oral sepsis, malocclusion, mouth breathing, food impaction, orthodontic treatment and the like. Systemic factors such as pregnancy, scurvy, and leukemia may also be present. When of local origin, the establishment of good hygiene and vigorous stimulation of the tissues by regular massage and functional use, will clear up most cases. Surgical removal may be necessary in some instances. When caused or complicated by systemic conditions local treatment should be supplemented by attention to the systemic factor.

Metallic Poisons

A third type of gingival disturbance is that caused by metallic poisons, such as arsenic, bismuth, copper, lead, mercury and phosphorus. For these metals the gingival tissues seem to have a definite affinity. When their poisons are present in the circulation they find their way into the gingivae, where under conditions of bad hygiene, they give rise to thrombosis, con-

gestion and other pathological reactions. These poisons also give rise to pigmentation in the gingivae which is more or less characteristic of the poison, such as the blue line in mercury, the bluish-black border in lead and bismuth, and the greenish color of copper. It is this unusual color that suggests the diagnosis. An interesting fact in this connection is the marked increase in the susceptibility of the gingivae to all metallic poisons under conditions of oral sepsis. On this point Goadby says: "In persons with perfectly clean mouths—that is, with no affection of the gum—the author has never seen a blue line.—Wherever observed it will be found most pronounced where tartar is attached to the teeth, and particularly if the mucous membrane of the gum is turgid and congested around the deposit of tartar, in other words where there is some mild or chronic gingivitis" (7).

Treatment in these cases consists of the removal of the poison causing the disturbance and the prompt establishment of normal mouth hygiene.

Systemic Disease as a Cause of Gingivitis

There is a fourth type of gingival inflammation caused by certain systemic diseases in which the reaction in the gingivae is but a symptom of the underlying disorder. Bunting says: "Disturbances of the *general health* and the *nutrition* of the body frequently produce marked changes in the tone and vital resistance of the gingival and peridental tissues and renders them more susceptible to injury from traumatic stresses and bacterial invasion. They therefore play important roles as predisposing factors in gingival and peridental disease. The circulation of the gingival tissues seems to be remarkably sensitive to changes in the general bodily health" (8).

This seems to be true of such diseases as scurvy, diabetes, purpura hemorrhagica, leukemia, agranulocytosis, etc. Hormonal disturbance may also bring about reactions in the gingivae. These reactions are rarely pathognomonic of the causative disease. "Nor is it usually possible to determine on examination whether an existing gingivitis is of local or systemic origin. This is unfortunate and makes it necessary that one be on his guard in all cases, especially those presenting unusual features or which do not yield readily to local treatment. It should always be remembered that what appears on the surface to be a simple gingivitis may, in fact, be the early symptoms of some unsuspected blood dyscrasia or other disturbance, the prompt diagnosis of which may be a matter of the utmost importance" (9).

Ulcerative Gingivitis (Vincent's infection)

Ulcerative gingivitis, usually considered under the designation of Vincent's infection represents a type of gingival disease quite different in its etiology and pathology from any of the foregoing groups. While infection undoubtedly plays an important part in all gingival disease, the ulcerative type is the only one caused by specific organisms, and which is also infectious. These organisms are the fusospirochetes in symbiosis. They are present in all mouths, their number depending upon its hygiene. For this reason positive smears are not of great diagnostic value. It is the only type in which there is ulceration and sloughing of the gingivae, and in which pain is a more or less marked symptom. It occurs in two forms, one acute, in which pain and sloughing are prominent features; the other a subacute type in which there is no sloughing and the symptom of pain is little more than a vague sensitiveness of the affected gingivae. Oral sepsis and tobacco smoking are both predisposing factors, one encouraging the growth of bacteria and the other tending to lower resistance. Differential diagnosis of the acute type is easily made because of the gingival slough and symptoms of general prostration. This is not so easily done in the subacute type because of its close resemblance to marginal gingivitis with which it is often confused. A differential diagnosis is best made from the symptom of pain and tenderness of the affected gingivae. In a suspected case, if there is no history of sensitiveness when the teeth are brushed and no pain, Vincent's infection can be ruled out even in cases of positive smears. Treatment consists in a careful, but thorough prophylactic treatment and the use of oxydizing drugs.

These briefly are the different types of gingival disorders commonly met with in daily practice. All are potentially serious,

representing in many instances, the first signs of periodontal disease, which if not heeded, may cause the eventual loss of the teeth. Their prevention and treatment should be the first duty of every dentist. The most important factor in accomplishing this is oral hygiene.

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380 Fifth Avenue.

In Memoriam

SIDNEY J. RAUH, D. D. S.

1873-1935

Those in attendance at the twenty-second annual meeting of the American Academy of Periodontology were considerably saddened by the news of the serious illness of Dr. Sidney J. Rauh of Cincinnati, Ohio, a loyal and most enthusiastic member who was devoted wholeheartedly to the promotion of dental health. On November 18th, 1935, Dr. Rauh passed on and the Academy lost one of its most dependable members. He is thought to have been largely responsible for making Cincinnati, as he himself described it, "the most dentally minded city in the country."

Dr. Rauh gave generously of his time to lecturing before schools, Mother's Clubs, nurses, groups of teachers and students on the importance of dental health. He recognized early in his career the importance of mouth hygiene for school children and was one of the pioneers in the movement which now has nation wide acceptance.

Dr. Rauh served as President of the Cincinnati Dental Society and was first President of the Cincinnati Free Dental Clinic Society which is to carry on an enlarged vision of his as a tribute to his memory. He was the champion of children, the negro and the underprivileged. He was ever ready to give the best that he had to dentistry and has left an indelible impression on those who knew him.

The sympathy of the Academy membership is extended to the gracious Mrs. Rauh with a sense of mutual loss.

Responsibilities of The American Academy of Periodontology

By Walter H. Scherer, D. D. S., F. A. C. D.
Houston, Texas.

Almost daily in the treatment of periodontal lesions, we sense our limitations and become conscious of a challenge to our responsibilities. As the representative group of this branch of dentistry, we are forced to admit our limitations and lack of accomplishment pertaining to some of the major phases of this art and science.

While the fundamental causes of periodontoclasia are still largely unknown, we can and do contribute an outstanding service in maintaining oral and general health. The attention of this Academy has been devoted to methods in treatment in periodontia, to research, and to educational programs. There is now, however, an insistent demand for an expansion of our services. The trend of the above activities and the status of our progress invites a consideration of our present obligations.

As the writer sees it, the major responsibilities of this Academy are: the study of the *prevention* of periodontal diseases; encouraging dentists to use modern methods of treating periodontal diseases; convincing members of both dental and medical professions that periodontal diseases are amenable to treatment; education of the public in the knowledge that these lesions are curable when properly treated; agreement on a nomenclature which will be acceptable to the representative dental groups of other nationalities; further research into etiology; standardization of tooth brushing technic; deeper interest in biology and hygiene; greater appreciation and wider distribution of the Journal of Periodontology.

When prevention and preventive measures in dentistry have been discussed, we were all agreed that preventive treatment should begin during pre-natal life. This idea of the proper preventive period had at one time, special reference to building of the teeth and osseous structures. We did not give consideration to the oral health of the child. Yet periodontal conditions in the mouths of young patients are often the forerunners of periodontal lesions in adults (1).

Dental care, including attention to the health of the gingivae, should be instituted at an early age. In addition to prenatal care attention to diet and other things relating to nutrition should continue at birth. Early post-natal care is even more important than the pre-natal care. The child should begin regular visits to the dentist at the age of two years, not later than three. This will provide for maintenance of normal function by the prompt filling of carious teeth and the maintenance of the normal height and mesio-distal dimensions of the deciduous teeth. Many of the prevalent mal-occlusions and traumatic occlusions in adults can be prevented if the deciduous teeth are restored to proper form and function as soon as the loss of tooth substance is detected.

Preventive measures in adults are more complicated. We admit our limitations as to the complete success of all preventive measures. This is especially evident in periodontoclasia having a systemic background (2). Prevention of Periodontal diseases for the masses, as distinct from the individual under expert care, is as yet nonexistent, and the outlook is frankly not encouraging, but there is always the hope that science will unravel the mystery by which, ideal occlusion will be produced with a high local resistance to infection.

It is the local conditions such as oral sepsis, disfunction, lowered resistance and bacterial accumulations, that are most easily controlled by preventive measures. These conditions can be controlled and a large number of periodontal diseases prevented or checked in their incipiency. Observation has shown that reduction of the bacterial flora of the mouth and stimulation of the periodontal tissues are among the greatest preventive measures at our command.

The Academy in its existence of twenty-two years has exerted we believe a definite influence upon practically every phase of dentistry. Its major accomplishment has

been in stimulating an interest in the profession in the treatment of periodontal diseases. Despite its progress however, too many people are still losing their teeth. To some extent this is unavoidable, but the majority of cases might be cured and many relieved by proper attention on the part of the dentist to periodontal diseases. There is an unfortunate attitude on the part of many members of the profession in their approach to the problem of periodontia. The belief that nothing can be done, accounts for the loss of many teeth. While much has been written on this subject, the necessity sity of arousing the profession as a whole to a realization of their obligation in this branch of practice still remains. There can be no question, but that periodontoclasia, treated in its incipiency, can be cured and kept under control, with the result that the period of service of the natural teeth can be greatly lengthened and in most instances continued throughout life.

A wrong conception of periodontal diseases is also held by many members of the medical profession and the public. During its brief existence, the evolution of dental education has advanced with great rapidity. The dental school of today provides a curriculum at least three or four times greater in extent than that of even a decade ago.

The Academy has undertaken the promotion of under-graduate, post-graduate, and lay education in the field of Periodontology. While some progress has been made, the results are not altogether satisfactory due to change of committee personnel and the magnitude of the task (3).

Dr. Arthur H. Merritt has outlined a standardized course on post-graduate instruction which covers the entire field of Periodontology thoroughly and is offered for the consideration of those engaged in post-graduate instruction. This outline is suitable for groups, society meetings, or post-graduate courses in colleges. The Academy has a Committee which is at work in compiling a list of slides to be used in post graduate courses in periodontia and which are to be made available to any one wishing to use them. The education of the laity presents a wonderful opportunity for this committee. If the publicity campaigns of the American Dental Association are to be continued, the committee can assist in properly presenting the facts concerning periodontal diseases and their treatment which should include a crusade against the patented pyorrhea cures now being sold to dentists and patients,—one of the chief factors in producing a skeptical profession and laity. The dental profession looks to this Academy to correct this weakness in our dental educational program.

I would urge the members of the Academy to increase their efforts to inform dental and medical practitioners, and the public by whatever means are most expedient, that periodontal diseases are curable excepting in the final stages.

Another phase of periodontia which still remains unsettled, is that of proper terminology. Students and practitioners find this confusing to the point of discouragement. The Academy has made a definite contribution to nomenclature. Nevertheless, at present, in the United States and Canada, we are using three different forms of terminology. It is said that fully 100 substitute terms have been suggested and are all probably more fitting than pyorrhea-alveolaris, but like Tennyson's brook, pyorrhea-alveolaris pathologically and etymologically "goes on forever."

This Academy through its Nomenclature Committee should begin its efforts to decide on a terminology which will best express the conditions generically. These terms, with modifying terms to express the various stages of so called pyorrhea-alveolaris, should meet all requirements of the case, and convey a definite meaning in languages such as English, French, German, and Spanish. It is right and proper for the Academy to claim representation on the committees of organizations dealing with dental terminology, including the American Dental Association and the Federation Dentaire Internationale.

An outstanding major responsibility of the Academy is the need of further research into the etiological factors of periodontal diseases.

Researches in periodontology are active in this country and abroad. The clinical observations of Reynolds (4) working with Becks, showed that 80% of periodontal

patients examined by them had some endocrine disfunction.

Dental research has been attracting to its advancement an increasing number of well trained observers. In breadth, and scope, it closely resembles research in other fields and promises, through increased efficiency of attack, to solve some of our major problems. To those who feel that dental research is not as successful as it might be because it has not completely solved some of these problems, it may be sufficient to suggest that cancer for example, has not yet yielded to widespread, well financed and highly competent research,

Standardizing tooth and mouthbrushing technic. This Academy prepared a bulletin on the home care of the mouth. It was an excellent compilation of the subject. Four methods of brushing were described, due to the fact that we are not in accord as to which is the superior method and what constitutes a standard shape and size of toothbrush. The modern toothbrush may not be perfect but its present status is a matter of evolution from the chew stick. Some in use today are fantastic and almost grotesque in shape and design. Some approach in size and dimension the well known kitchen floor scrubbing brush of the early nineties.

The dental profession and the public have for many years had the conception that the brush was primarily a scrubbing brush. As a matter of fact the toothbrush has its greatest value as an instrument for promoting vigorous circulation of the blood. In order that it may produce the most beneficial results, it is important that it be of correct design. Periodontists are in accord that the weakest link in former methods of treatment has been immeasurably strengthened by adopting the practice of stimulation of the gingival circulation.

Four methods of brushing technic were advocated in this bulletin on "The Home Care of the Mouth." Two for healthy mouths and two for mouths in which periodontal diseases were evident. Each of these methods are said to produce the desired result. Your dentist, so it is stated, will advise you which is best suited to your individual requirements. Granting that different methods of artificial stimulation are indicated to meet existing conditions, these exceptional cases call for other methods of stimulation than by toothbrushing. It is this rather than different methods of brushing that are needed.

If it is true that 90% of the people have periodontal and tooth defects, is it not reasonable to treat a normal mouth as an abnormal condition and thereby prevent dental and periodontal lesions? The dental profession looks to this Academy for accepted and scientific methods of treatment and teaching. The Academy can render a conspicuous service to the profession by standardizing the technic of tooth and mouth brushing.

The need of a biologic appreciation in treatment. In our dental literature of today very little appears regarding the biological problems or their relationship to the diseases of the periodontium (5). There is a biologic mechanism within the body which functions for the purpose of maintaining the life of the organism. This innate faculty operates within the mouth as it does elsewhere in the body. Periodontia is a biologic problem and there is a need of more scientific knowledge relating thereto.

The return to health is our objective in treatment. This should lead us to the consideration of the science of health. Hygiene is said to be the name of the science which is devoted to the understanding of the biologic forces producing health. When disease enters into the clinical picture, the biologic mechanism of the cells is functioning under a handicap. The more advanced the state of disease, the greater the handicap, but with teeth and tissues carrying the burden of defective function, the pathological state unaided cannot be overcome. A proper appreciation of the biologic processes of repair will direct our attention to the living cells adjacent to the lesion, rather than the dead ones contained in the lesions. It has been held that some of the processes which destroy the periodontal tissues are not essentially of an inflammatory nature. The biologic problem as applied to treatment, centers around the regenerative powers inherent in all living tissues. This constructive activity results in the development of the organisms and a continuance of structural form. Living cells need nutrition to endure and nutrition is dependent upon function. When function is altered to a perceptible degree, changes occur which

lead to degeneration. General health and dental health are similar, for health is a bodily condition, the same as disease. Both are dependent on the life of the organism and both cease when death occurs. When disease develops, however, the health mechanism which is the sole intent of the science of hygiene, breaks down. If treatment is to be directed along more rational lines, a deeper knowledge of the nature of health and its biologic laws is needed.

Establish more definitely the indications and contra-indications of radical and conservative treatments. A difference of opinion regarding the choice of methods of treatment has developed, not only among periodontists but general practitioners also. This difference may be due to a difference of opinion regarding the reaction of periodontal tissues to treatment.

Some of the radical surgery advocates claim that the periodontal pockets represent permanent detachments of the pericementum, which cannot be reattached by any method of treatment. Hence the justification of the removal of the outer wall of the pocket. The conservative group believe and prove their claim that reattachment can be obtained.

What should be the deciding factors in our choice of treatment in a given case which is amendable to treatment by either a conservative or one of the several methods of surgical treatment? (We are assuming that the patient's history, social and economic status, prognosis, cooperation, etc., is favorable to either mode of treatment.) Should we be governed in our choice of treatment by a flare for the spectacular radical surgery requiring four or more extensive operations, resulting in considerable trauma, shock and frequently post-operative complications?

When it is *indicated*, including the time and economic factors, surgical treatment is the choice of method and has a distinct place in the treatment of periodontal diseases. Among the chief objections to radical surgery are disfigurement, sensitiveness of exposed root surfaces, post-operative pain and an increased difficulty in keeping the mouth clean.

Considerable impetus to radical surgical treatment has been given to general practitioners and oral surgeons by an oral surgeon who has invaded this field and is encouraging other oral surgeons to do likewise. He admits his lack of knowledge of periodontal treatment, but calls attention to his superior surgical skill in the oral cavity. He closes his article, quoting without reference: "Some members of our specialty have been able to save countless numbers of teeth, restoring patients to health and more than doubling our incomes as a result of this added service." A most unprofessional argument favoring a procedure which in most cases is detrimental and unfortunate for the innocent and trusting patient.

The successful treatment of periodontal diseases calls for a variety of methods. The conscientious operator will study his cases and know when the conservative and when radical treatment is indicated. A tooth or teeth may be restored, but periodontal tissues ruthlessly destroyed are beyond restoration and replacement. Surgical periodontia is an indictment of the dental profession, made necessary only, because of its failure to live up to its responsibilities in the prevention or early treatment of periodontal lesions.

Appreciation, support and wider distribution of the Journal of Periodontology. The Commission on Journalism of the American College of Dentists say of our Journal that, "it represents one of the finest examples of true journalism, and that other specialties might well follow this lead." This is a splendid endorsement and a high tribute to our efforts in journalism. I quote this opinion of the Commission on Journalism to increase the pride and responsibility that each Academy member should feel in this contribution which is being made to dental literature.

Proper appreciation of the Journal involves the responsibility of increasing its circulation, not that, that will aid the Academy, for the subscription price does not cover the cost of publishing and mailing, but in making more dentists "mouth health conscious." A journal of its type is never out of date and should have a wider circulation among the members of the dental profession The Editorial Board and Subscription Committee have worked diligently to increase the circulation, and to assist in this endeavor, we would suggest that each member contact his local district

and state society members and acquaint them with the value of the Journal.

In order to increase and further the scope of the Journal, we propose that an Endowment Fund be raised by voluntary subscription among members of the dental and medical professions and others who may be interested. This fund to be used for more frequent or special issues at the discretion of the Editorial Board and the Council. Whatever we may accomplish in this direction will add value to this Memorial to our beloved Gillette Hayden.

These suggestions are made as ways in which we may rededicate ourselves to the Academy and the future progress of Periodontology.

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The New Orleans Meeting

The officers and the committees responsible for the Twenty-second Annual Meeting of the American Academy of Periodontology are to be congratulated. The program was excellent, the local arrangements were most satisfactory and the attendance was far beyond expectations.

A number of the papers read in the several sessions are published in this issue of the Journal of Periodontology. The very full program of scientific and practical papers and lectures was of superior quality as were also the clinics. The Discussion Luncheon was very well attended but many of the older members missed the traditional dignity and value for which this feature of the Academy meetings has been noted.

The beautiful New Orleans Country Club was ours for the evening of the banquet, through the courtesy of Dr. Haidee Weeks who neglected nothing relating to our enjoyment and comfort not only on this one evening but throughout our entire stay in New Orleans.

Another successful Academy meeting has served to emphasize the value of periodontology and to promote its development.

BOOK REVIEWS

"Anaesthesia in Dental Surgery." By Sterling V. Mead, B. S., M. S., D. D. S., Review in: The Journal of the Kansas State Dental Association, October, 1935, p. 9.

This book is indeed a worthy companion to Dr. Mead's well-known books on oral surgery and diseases of the mouth. It is a book that no general practitioner of dentistry can afford to be without. It contains nearly 500 pages with 440 illustrations, and describes in detail every form of anaesthesia, local and general, as used in the field of the general practitioner and the oral surgeon.

Dr. Mead's vast experience as teacher, clinician, and essayist in this field of endeavor qualifies him to speak authoritatively, and we trust the publishers will experience a large sale of this most excellent and comprehensive treatise. We heartily recommend it to our readers—Copy.

"A Textbook of General Bacteriology." By Edwin O. Jordan, Ph. D., Professor of Bacteriology in the University of Chicago and in Rush Medical College, Chicago. Eleventh edition, entirely reset. 1935. Pages, 825, with 202 illustrations. Review in: D. Cosmos, 77 (12): 1235.

The fact that this book is now in its eleventh edition is in itself a high recommendation. As the title of the book indicates, the author attempts to give the reader a general knowledge of bacteriology. Toward this end chapters on the bacteria of air, soil and water, on bacteria in industries, on the bacteria of milk and milk products and on the bacterial diseases of plants are presented, in addition to subject matter which is more or less commonly found in textbooks on bacteriology. For those who are interested in the more specialized phases of bacteriology, complete bibliographic references are given.

The book is quite up to date, many of the references cited being as recent as 1934. A new chapter on "Bacterial Heredity and Variation" dealing with bacterial mutations and adaptations, has been added. In the chapter on " Diseases of Unknown Origin," dental caries is mentioned. The section dealing with the spirochetes of the mouth is short but gives the essential facts.

In reading this book one realizes again and again how difficult is the problem of classifying bacteria, and how far off a uniform nomenclature still appears to be. Jordan's "Textbook of General Bacteriology" is vividly written. The subject matter is arranged and presented in an orderly and lucid manner. While the figures are not original, they were apparently chosen with great care, and serve well the purpose for which they are intended. Both the student and practitioner interested in bacteriology will find this a very satisfactory and complete book.—Copy

A Textbook of Biochemistry. Edited by Benjamin Harrow, Ph. D., Associate Professor of Chemistry, The City College, College of the City of New York, and Carl P. Sherwin, M. D., Sc.D., Dr. P. H., LL.D., Member of the Staff of St. Vincent's Hospital and French Hospital, New York City. 797 pages; 52 illustrations. 1935. Review in: J. Am. Dent. A., June, 1935. P. 1083.

A textbook of nearly 800 pages on the subject of biochemistry must of necessity have much in it of interest to dentists. In fact, a slight addition might logically have been made to the preface where it says: "The text, which has been planned for teachers and students of medicine, chemistry and allied branches," etc. Dentistry should definitely have been included in its purview. Surely in all conscience, during recent years, the literature of dentistry has contained sufficient material on the subject of nutrition and diet to justify its inclusion in a textbook of this character, and logically enough, when we go to the body of the book, we find that much consideration has been given this subject.

The authors have gathered around them no fewer than thirty contributors, which in itself speaks eloquently for the comprehensive character of the volume. Naturally, the chapters that must appeal most to den-

tists are found in a study of those processes that deal with diet as it affects the bones and teeth, and, in particular, the relationship between nutrition and tooth decay. The statement is made that, "In recent years, there has been an increasing interest among nutritional investigators in the relation of the diet to tooth decay." This would seem to be a very appropriate study in connection with the biochemical phase of the subject, and it is no reflection on the up-to-date character of the book to be forced to realize the fact that, after reading this chapter, there is found in it little of a really significant or conclusive character. This cannot be said to be the fault of the book or of the chapter, but is merely an expression of the prevalent lack of finality in the current comment of the day on this topic.

After the most laudable efforts that have been made in our recent literature to throw light on this subject, the conviction is being forced on us that the study of nutrition and diet is not the whole story to the question of dental decay. Not that we should minimize the great importance of nutrition, but that there are other agencies that enter into this problem. No one should be permitted to think lightly of the question of diet when, for instance, the statement is made that: "Pellagra is a national health problem in the United States and a few other places," and "approximately 200,000 persons are now suffering from the disease in this country because of inadequate diet."

Probably the word "vitamin" has been used with greater frequency and less understanding than any other in our literature, and the chapter on this subject in the present volume will yield much needed information. It is a subject that cries for further study and a simpler elucidation before the average medical and dental mind can fully grasp it, and this is all the more apparent when we read the statement that "Today, no less than nine vitamins are recognized, and the existence of others is suspected." Other studies of interest to dentists are found in such topics as "Detoxication," "Enzymes" and "Hormones," terms that appear in growing frequency in our periodic literature, and that call for further study on the part of every dental practitioner.

To analyze in detail all of the various agencies at work in a consideration of the biochemistry of the human organism is, of course, quite out of the question in the limits of a brief review of this character, and for a further consideration of this important and fascinating subject, the reader is referred to the book itself. It will repay the time and effort spent on it.—Copy.

Clinical Diagnosis of Diseases of the Mouth. By Hayes, Louis V., A. B., D. D. S. With an introduction by Leo Winters, D. D. S., M. D., Sc. D., LL. D. 461 pp. Copy of Review in J. Am. Dent. A. Page 2170, Dec., 1935.

One of the virtues of this book is that the author goes at once to his topic in the treatment of his subject, and when he gets through, he stops. Here is a volume of 461 pages with less padding than occurs in most books of half the size. According to the author, diagnosis is the keystone of dentistry as it is of medicine, and if we follow the matter further, we find that diagnosis properly applied has a direct bearing on the prevention of disease, and to correctly diagnose a case is to accomplish one of two things: if the affection is in the incipient stage, further inroads may be prevented; if it has progressed farther, the proper treatment may be instituted. In either case, diagnosis is considered essential. An indication of the up-to-date character of the book is found in the consideration of "agranulocytosis." This is a disease that in recent times has caused much concern, and there is actually little to be authoritatively said on the subject, but what little there is is found in this volume. This is characteristic of the book as a whole. A notable feature of the volume is the very comprehensive bibliography near the end, consisting of approximately eighty pages. The illustrative contents of the book are exceptionally satisfactory. The colored plates are most impressive, and they add greatly to the attractiveness of the volume. All of this is accentuated and made possible by the superior quality of the paper. The book is a most worthy addition to the literature of dentistry, and should be highly commended.

Dental Medicine, by Broderick, F. W., M. R. C. S., L. R. C. P., L. D. S. A revised second edition of Dental Medicine, 1936.

Broderick again stresses colloidal dis-

quilibrium as the etiological factor in the production of caries and pyorrhea. These two conditions, according to the theory, are due to a systemic and not a local cause. They are a part of a general syndrome and their presence may be utilized as a symptom of a disturbed body chemistry and physics. Treatment therefor is directed to correct the syndrome and not the local condition.

Broderick's theory is based primarily upon J. E. R. McDonagh's theory of the "Nature and Origin of Disease," in which he propounds the dictum that there is only one disease, that of colloidal disequilibrium, and essentially only one invader, in that the action of all is exactly the same, viz., to bring about this disequilibrium which, although differing in degree and quality according to the condenser action of the particular invader, whether this be a micro-organism or a chemical intoxication, always follows the law of the chemico-physical properties of matter in the colloidal state. He contends that the action of drugs, through producing changes in the plasma particles, will eventually produce morbid changes in tissues and organs identical with those of disease; that, in other words, they act themselves as invaders, that it is, in fact, because of this that they are useful therapeutically.

In concluding the chapter on "The Problem" he gives his conception of the fundamental underlying causes of the prevalence of the dental lesions of dental caries and of pyorrhea alveolaris, in which he says: "I believe that these rest upon a constitutional imbalance in the vegetative system of the body, which sets the threshold for each particular individual from which the environmental strains and stresses of life commence to act. That as a consequence of these strains, be they dietetic, physiological or psychological, there comes about a tendency to an alteration of the reaction of the saliva, which alterations, combined with other metabolic disturbances dependent upon the same basis of vegetative instability, bring about changes in the dental tissues, according to definite biochemical laws which lead to the destruction of the dental enamel, or of the supporting tissues of the teeth."

McDonagh is quoted as showing that the first effect of a microbic invasion of the body is upon the protein particles of the plasma. The whole matter resolves itself into one of electric condensation; whichever, the protein particles of the plasma, or those of the micro-organism, are the most condensed, i. e., have the greater electric charge, will rob the other of electrons and tend to drive it into solution. At the commencement of every infection some of the plasma particles lose electrons to the invading organisms; consequently they will tend to pass into solution (molecular dispersion). Other particles increase in size or agglutinate. These changes constitute condensation, which is thus seen to be of two types, becoming more marked as the infection proceeds: (1) the lytic type of condensation, in which the particles pass into solution; and (2) that in which the surface electricity is withdrawn to the center in which the particles get larger and become more stable, tending to pass into coarse dispersion, i. e., again to lose their colloidal properties.

If the protein particles of the plasma become more condensed than those of the micro-organisms, the process is reversed, and they rob the particle of the organism of electrons and drive them into solution (bacteriolysis); the outcome of the invasion, then, depends upon which becomes the more powerful condenser, the particles of the plasma or those of the organism; which matter constitutes the phenomenon of immunity, rather than that of the presence of a number of antibodies, hypothetical substances which are supposed to be present in the blood, a separate antibody for every possible infection, if the subject is to be immune from all possible infections.

In the chapter "Method of Investigation" the ultramicroscopic examination of the protein particle reveals, according to the size of the protein granules and the Brownian movement, the tendency to either acidosis or alkalosis.

The part played by the endocrine glands, especially the thyroid and adrenalin system, their accelerator or katabolic properties are emphasized as sympathetic stimulators, and the hormones of these glands are used therapeutically in cases of parasympathetic dominance. (alkalosis.)

The saliva is claimed to reflect the PH of the blood plasma and tissue fluids, the

PH of which is used as one of the diagnostic methods of determining the tendency to an acidosis or alkalosis.

Broderick suggests that, in the prevention of these conditions, several lines of approach are possible; (1) that of the disturbance in the acid-base equilibrium of altering the reaction of the saliva to the alkaline side, so that the passage of calcium-ions may be from the saliva to the tooth rather than from the tooth to the saliva; and indirectly, in the case of pyorrhea in an attempt to correct the colloidal disequilibrium on which all the cardinal symptoms of the condition depend; (2) that of the imbalance of the vegetative nervous system, the sympathetic parasympathetic balance, by stimulating the side that is deficient or by depressing that which is excessive; (3) that of the calcium-potassium ratio, the administration of the divalent or the monovalent salts, as the case may be; (4) that of attempting to deal directly with the colloidal disequilibrium by dehydrating or hydrating the protein particles of the plasma; and (5) through the medium of organotherapy. It will be understood, however, that whichever method is used, or whatever combination of methods is undertaken, the same sequence of changes will be operative, in that the vegetative status of the patient, which is really what we are attempting to influence, is the sum result of the product of vegetative nervous influences, of the proportion of H to OH ions, of the calcium-potassium ratio, of hormonic balance, and of colloidal equilibrium, all of which react the one upon the other. Further, even when only one of these methods is utilized, the general vegetative changes which will result therefrom will be the same whichever is chosen; for the administration of alkalies, for example, will diminish the calcium-potassium ratio, depress thyroid and adrenal activity, and hydrate the protein particles of the plasma. Similarly, the administration of atropine to paralyze the vagus nerve endings (parasympathetic) will increase the calcium-potassium ratio, increase acidity, and dehydrate the protein particles. The particular method of treatment chosen will depend, primarily, upon convenience. The use of insulin in arresting or preventing caries is utilized, based upon McDonagh's theory, that a hormone regulates colloidal behavior.

Broderick considers all pyorrhea patients as potential allergics. This view is confirmed by Dr. James C. Healey, Francis H. Daley, D. M. D., and Marian H. Sweet, A. B. Tufts Dental School, Boston, Mass., in their discussions of "The Medical Aspects of Periodontoclasia and Gingivitis." (The Journal of Laboratory and Clinical Medicine, April 1936, Vol. 21, No. 7.) In summarizing their cases they say: "These cases which we believe to be of an allergic nature, it may be said that they have certain diagnostic features in common; eosinophilia capillary dilatation, increased permeability, exudation." Other important findings in several cases were history of food idiosyncrasies or familial predisposition, positive skin reactions, and positive skin tests with urinary proteose.

Because of recent advances in physiological chemistry, Broderick's interpretation of the origin of disease is far more interesting than it was at the time he wrote his first edition. Drs. Ghormley and Stuck of the Mayo Foundation in an article "Experimental Bone Transplantation" (Archives of Surgery, April 1934) say: "The belief is growing that the processes of osteogenesis, regeneration of bone and healing of bony defects, are far more complicated than was previously thought. It is being recognized that these biologic manifestations are dependent on intricate biochemical or 'humoral' phenomena with which investigators are but slightly familiar. As Leriche and Policard pointed out: The problem of osteogenesis has passed through many phases. It has been histological and surgical and at the present time it is above all chemical . . . . . .It is now the turn of the chemists and physicists. They alone can open up new horizons by giving us some of the certainties which we lack." This theory is also held by such investigators as Dr. Clay Ray Murray, Columbia University (Archives of Surgery, Sept. 1934) Drs. Haldeman and Moore, of the University of California, (Archives of Surgery Sept. 1934).

Dr. George W. Crile of Cleveland in his recent book entitled, "The Phenomena of Life" traces life force to electricity. His conception is that "not only this or that

but every phenomena of life can be identified in the terms of physics and can be explained in the light of a Radio-Electric Theory."

The many references that are used in the discussions would indicate that this interesting unorthodox theory has at last become semi-orthodox. This book should be read by every student of dentistry.

Broderick quotes Herbert Spencer as saying, "There is a principle which is a bar to all information, which is proof against all arguments, and which cannot fail to keep a man in everlasting ignorance; this principle is—contempt prior to investigation."

J. A. Sinclair, D. D. S., F. A. C. D., O. C. Barker, D. D. S.
Asheville, North Carolina.

Meyer's Normal Histology and Histogenesis of the Human Teeth and Associated Parts. Translated and edited by Herman R. Churchill, Tandarts (Utrect), D. D. S. (Georgetown University) Dr. Med. Dent. (Rostock). 1935. Pages 305, with 324 illustrations, 26 of these being in color.

This is the English translation from the German of "Lehrbuch des normalen Histologie und Entwicklungsgeschichte der Zähne des Menschen," by Doktor Wilhelm Meyer dean of the dental faculty of the University of Königsberg. The photomicrographs used are original and considered among the very best. The book is a masterpiece and the English edition an unusually clear translation. The value of the original has been increased by the editorial comments of Dr. Churchill and the addition of a number of valuable illustrations. The work is highly recommended to both dentists and physicians.

The Patient and the Weather—Autonomic Dysintegration. By William F. Petersen, M. D., with the assistance of Margaret E. Milliken, S. M. Review in: J. Am. Dent. A. May, 1935. P. 897.

This is the second volume of a series that will number five or six before completion. It comprises 530 pages including the index. The author says of the work that "it is an interpretation of disease localization predicated on the continued effects of meteorological factors in bringing about stimulation, overstimulation, disease and death." This volume brings together observations made on the individual who is unusually responsive to the environment. The author recognizes that, because of the commonplaceness of the thesis, it is the least impressive to the physician of today. The discussion of teeth and the episodes affecting them are provided by Dr. Stephen of the College of Dentistry of the University of Illinois. Dr. Petersen is in the department of Pathology of the College of Medicine of the same institution.

Nutrition and Physical Fitness. By L. Jean Bogert, Ph. D. Second Edition 1935.

The first edition of this book appeared in 1931. The quantity of research being done and the progress made makes revision of texts on nutrition necessary at frequent intervals. Accordingly, Bogert has rewritten some chapters and added to or changed the data given in the first edition. While the text is accurately compiled and is full of information from laboratory and experiment station, it is simply written, and even if not for lay reading, a layman may readily understand it.

—T.

Paying through the teeth. By Bissell B. Palmer, 1935.

This popular book of Dr. Palmer has already been so frequently reviewed and so generally read as to make further comments unnecessary. It is an ideal volume for the dentist's reception room, supplying

a painless method of educating dental patients concerning dentifrices, mouthwashes, and pyorrhea remedies.

The author's courageous presentation of facts is such as to leave no doubt in the mind of the reader as to the necessity of guarding himself against exploitation in mouth and tooth remedies at least.

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